The World Health Organization (WHO) is a specialized agency of the United Nations and represents the culmination of efforts to establish a single inter governmental health agency As such, it inherits the functions of antecedent organizations such as the Office International d Hygiène Publique, the Health Organization of the League of Nations, and the Health Division of UNRRA

The World Health Organization had its origin in the proposal made at the United Nations Conference held in San Francisco in 1945 that a specialized agency should be created to deal with all matters relating to health In 1946, representatives of 61 governments met at the International Health Conference New York,

established

The work of the Organization is carried out by three organs the World Health Assembly, the supreme authority, to which all Member States send delegates, the Executive Board, the executive organ of the Health Assembly, consisting of 18 persons designated by as many Member States and a Secretariat under the Director General

The scope of WHO s interests and activities exceeds that of any previous international health organization and includes programmes relating to a wide ... health questions malaria,

... nates in certain technical work of ...

L'Organisation Mondiale de la Sa... (OMS), institution spécialisée des Nati... Unies, représente l'aboutissement ... efforts tentés en vue d établir une orga... sation intergouvernementale unique ... matière de santé Comme telle, elle ... hérité des fonctions d'organisations an... rieures, notamment l Office Internatio... d Hygiène Publique, l Organisation d H... giène de la Société des Nations et ... Division sanitaire de l UNRRA

spécialisée chargée de toutes les questio... de santé En 1946, les représentants ... 61 gouvernements se réunirent en Con... rence Internationale de la Santé à Ne... York, élaborèrent et signèrent la Cons... tution de l OMS, et créèrent une Cor... mission Intérimaire devant reste ... fonctions jusqu à ce que la Const... ... eut été ratifiée par 26 Etats Mer br... des Nations Unies La Constitution e... entrée en vigueur le 7 avril 1948, ... Première Assemblée Mondiale de la San... s est réunie à Genève en juin 19... , ... l Organisation permanente a été ét... 1er septembre 1948

Le travail de l Organisation s'effectu... ... de trois organes

l autorité du Directeur général

Les objectifs et les activités de l OMS...

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Nº 15

FIRST INTERNATIONAL SYMPOSIUM ON YAWS CONTROL

PREMIER SYMPOSIUM INTERNATIONAL SUR LA LUTTE CONTRE LE PIAN

WORLD HEALTH ORGANIZATION
ORGANISATION MONDIALE DE LA SANTÉ
PALAIS DES NATIONS
GENÈVE
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CONTENTS

(The papers are presented in the order in which they were read at the symposium)

TABLE DES MATIÈRES

(Les articles se succèdent dans l'ordre de leur présentation au symposium)

Part IV Development of plans of operation
Partie IV Développement des plans d'opération

Part V Demonstration, survey, and training phase
Partie V Démonstrations, enquêtes et formation technique

Part VI Expansion phase
Partie VI Phase d'expansion

Part VII Consolidation phase
Partie VII Phase de consolidation

Part VIII Role of international organizations
Partie VIII Rôle des organisations internationales

INTRODUCTION

During the past decade, there have been two major advances that were destined to influence public-health programmes directed at the elimination of yaws

The first of these was the development of a new and greatly improved form of therapy Ehrlich's dream of a single injection cure has come true, for there is available today—in the newer repository penicillin preparations—a form of treatment that is therapeutically efficacious, negligible in toxicity, low in cost, and readily administered to the patient It was inevitable that such a potent therapeutic agent should be applied on a large scale to the masses of people afflicted with yaws

The second development was the advent of international health work permitting direct services to countries The World Health Organization, in addition to carrying out the functions inherited from the Health Organization of the League of Nations, has undertaken to carry out health projects involving the use of internationally recruited specialists and internationally financed supplies and equipment in many of the underdeveloped areas of the world

The merger of these two forces has made possible a broad frontal attack on yaws, and within the past few years large-scale projects to bring penicillin therapy to the masses of people have been undertaken, with the technical guidance of WHO and with supplies furnished by the United Nations International Children's Emergency Fund (UNICEF), in Haiti, Indonesia, Thailand, and the Philippine Islands The concept of communicable-disease control by mass treatment is a comparatively new one, but only because the means for attaining the end have heretofore been lacking Now that a suitable therapeutic agent is available, the work has gone forward rapidly and with considerable success

The First International Symposium on Yaws Control was organized because the time had come for those who had had experience with this new and potentially decisive approach to yaws control to review their experience, to share it with others and, through collective consultation and frank discussion, to decide on the most appropriate way to effect yaws control in the light of the current knowledge

The Symposium was developed along the following lines The first day was devoted to taking stock of the present information on yaws, and the second to a review of the available information on the use of antibiotics, particularly penicillin, in the treatment of yaws During the next

five days, consideration was given to the five phases through which yaws control project usually evolves (1) preliminary analysis of the extent and nature of the problem, (2) development of plans of operation suitable to the local conditions, (3) demonstration, survey, and training, (4) expansion of the project into a mass treatment campaign, and (5) consolidation wherein the gains of the mass campaign are integrated into the permanent health structure of the area concerned On the final day of the Symposium the subject was the role of international organizations in assisting governments in their efforts to control yaws

Over seventy health workers from all parts of the world attended the Symposium It was the consensus of their opinion that the proceedings of the sessions should be made available to all who have an interest in this disease WHO therefore presents herewith the more important scientific papers that were presented and summaries of the discussions that took place In doing so, the Organization hopes to further the cause of yaws control, extending it beyond the limited group who attended the Symposium

INTRODUCTION

Durant les dix dernières annees, deux evenements importants ont influence l'organisation des programmes de sante publique visant à éliminer le pian

Le premier a ete la decouverte d une therapeutique nouvelle et perfectionnee Le reve fait par Ehrlich d un traitement par injection unique s'est realise Les recentes préparations de penicilline retard ont permis d instituer une forme de traitement efficace, tres peu toxique, peu coûteux et facile à administrer L application au traitement systematique des populations victimes du pian d un agent therapeutique aussi puissant s imposait

Le second a ete l'avenement du travail international dans le domaine de la sante, il devenait dès lors possible d intervenir directement pour aider certains pays L Organisation Mondiale de la Sante, outre l exécution des

et avec du materiel [illegible]

Les deux armes nouvelles dont il vient d'être question ont permis d'attaquer de front le probleme du pian Au cours des quelques dernieres annees, de vastes programmes de penicillinotherapie au sein de populations entières ont éte entrepris a Haiti en Indonesie, en Thailande et aux Philippines, sous la direction technique de l OMS et avec le materiel fourni par le Fonds International de Secours à l Enfance (FISE)

L'idee de la lutte contre les maladies transmissibles par le traitement systematique des masses est relativement nouvelle, pour la simple raison que les moyens de la realiser faisaient jusqu'à maintenant defaut Depuis que l on dispose de moyens therapeutiques adéquats, le travail a avance rapidement et avec grand succès

Le Premier Symposium international de Lutte contre le Pian repondait à une nécessite En effet le temps etait venu pour ceux qui avaient entrepris la lutte contre le pian avec les moyens nouveaux de confronter leurs experiences, de les communiquer à d autres et — grâce à des echanges de vues et à des discussions objectives — de choisir, a la lumiere des connaissances actuelles les moyens de lutte les plus feconds

Les exposés et discussions se sont succede comme suit le premier jour a eté consacre à faire le point des connaissances actuelles sur le pian Au cours de la seconde journee, les données concernant l'usage des anti biotiques de la penicilline en particulier, dans le traitement du pian, ont été passées en revue Durant les cinq jours suivants il fut question des cinq phases successives selon lesquelles se développe généralement un programme de lutte antipianique 1) analyse préliminaire de l etendue et de la nature du problème, 2) developpement d'un plan d'operations adapte aux condi tions locales, 3) phase de demonstrations, d enquetes, de formation du personnel, 4) phase d expansion du projet sous la forme de traitement systématique de la population, 5) phase de consolidation dans laquelle les acquisitions faites au cours de la campagne de traitement systématique sont intégrees dans l'organisation sanitaire permanente de la région Durant la dernière journée, les participants au Symposium examinèrent le role que les institutions internationales peuvent jouer en aidant les gouvernements à lutter contre le pian

Plus de soixante dix personnes engagees dans les activités sanitaires venant de toutes les parties du monde, prirent part au Symposium Chacun estima qu il était de toute importance de mettre a la disposition de ceux qu'intéresse la lutte contre le pian les comptes rendus des seances Pour répondre à ce vœu, l OMS a reuni dans cette publication les principaux travaux scientifiques présentes et les resumes des discussions qui suivirent Ce faisant elle espere, en agrandissant le cercle restreint des specialistes qui prirent part au Symposium, donner une impulsion nouvelle à la lutte contre le pian

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Part I

BIOLOGY OF YAWS

Partie I

BIOLOGIE DU PIAN

Part I

BIOLOGY OF YAWS

Partie I

BIOLOGIE DU PIAN

BIOLOGICAL INVESTIGATIONS ON TREPONEMES

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Comparative Study of Strains of Syphilis, Yaws, and Bejel Treponemes

For a number of years the senior author and his associates have been interested in the biological relationships existing among the treponemal group of micro-organisms and the reaction which they induce in an animal or human host[4, 5, 10, 11, 13] More recently, the development in this laboratory by Nelson, Mayer and their co workers[8, 9] of a practical test for the detection of a specific antibody in treponemal infections has permitted a new approach to the study of the immunogenic relationships among these organisms Unfortunately, technical difficulties are still encountered in the quantitative estimation of a treponemal antibody in serum so that it has not been possible to exploit this new method to the greatest extent anticipated Nevertheless, many of these difficulties are being overcome, and definitive data should eventually be forthcoming

Comparative studies previously reported on *Treponema pallidum* and *T pertenue* isolated in Jamaica and strains of *T cuniculi* isolated from domestic rabbits in our own laboratory have shown that these organisms have many characteristics in common, including a degree of immunological reciprocity On the other hand, differences in the disease picture were noted, and these differences seemed to arise from fairly stable characteristics of the organism

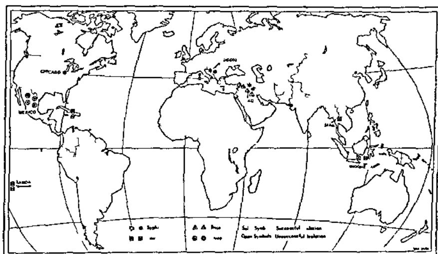
With the development of the treponema immobilization test, some of these strains were examined to determine their behaviour against standard' pools of serum from animals infected with each of the strains These studies, reported by Khan, Nelson & Turner,[7] indicated a significant immunogenic difference between syphilis and yaws on the one hand, and cuniculi strains on the other, but no substantial difference between the syphilis and yaws strains tested However, the studies were limited to

a few strains and to strains which had been separated from their natural hosts for 10-15 years

Isolation of Strains

It was considered desirable to carry out similar studies on a large number of strains more recently isolated from different parts of the world and from patients with various clinical syndromes Accordingly we have been attempting to accumulate strains and other materials during the past year and a half The strains isolated to date are shown in fig 1

FIG 1 GEOGRAPHICAL SOURCE OF STRAINS OF TREPONEMA ISOLATED DURING 1950-1



It will be seen that altogether 12 strains have been isolated of which 3 are strains of venereal syphilis (1 from Chicago and 2 from Baghdad) 2 of endemic syphilis (from Bosnia) 4 of yaws (1 from Indonesia 1 from Samoa and 2 from Haiti) and 3 of bejel (2 from Syria and 1 from Iraq) Isolations were not successful from some material obtained in Indonesia Samoa Iraq and Siam the strain of yaws isolated from Samoa was never firmly established and was subsequently lost

In many of the attempted isolations referred to above both rabbits and hamsters were inoculated While there was no instance in which ... when the rabbit inoculated we believe that the use of the chances of successful

isolation

More recently one of us (Hollander), in collaboration with Dr Gerardo Varela and his associates of Mexico City, has made transfers of darkfield positive material from four patients with typical lesions of pinta No lesions developed in either rabbits or hamsters, but in two hamsters, each inoculated from a different patient, typical motile treponemes were demonstrated in the inguinal lymph node by darkfield examination Unfortunately the strain was lost upon transfer to other hamsters

Comparison of the Disease Picture in Rabbits and Hamsters

The syphilis strains, including those from Bosnia, in general produce lesions in rabbits similar to other syphilis strains previously isolated and studied Whether inoculation is made into the testis or into the skin, the lesions tend to be large and indurated The yaws strains likewise have followed the usual pattern of a rather long incubation period with the development of lesions which are less extensive and much less indurated than those produced by the syphilis strains The bejel strains appear to lie somewhere between the other two groups in terms of pathogenicity

It must be recognized, however, that we are dealing here with characteristics that are difficult to estimate quantitatively Suffice it to say that, viewing our experience as a whole, it has been much more difficult to work with the yaws strains and, to a certain extent, with the bejel strains, than with the syphilis strains For example, it has not yet been possible to obtain satisfactory treponemal material for immobilization tests from any of our new yaws strains

Bessemans & de Moor[2] reported that hamsters as a rule develop only symptomless infection upon inoculation with *T pallidum* or *T cuniculi*, although treponemes could often be demonstrated in the lymph nodes by direct darkfield examination We have found that each of the newly isolated strains of syphilis, yaws, and bejel, as well as the well known Nichols strain of syphilis, has the capacity to invoke lesions in hamsters following inoculation into the skin of the scrotum or lip

The character of lesions which contain treponemes in abundance does not differ significantly according to the species of treponeme inoculated The yaws and bejel strains have produced lesions in a higher proportion of inoculated hamsters than have the syphilis strains Moreover, most of the hamsters which have developed very extensive lesions have been inoculated with either yaws or bejel treponemes Data are as yet inadequate to justify the conclusion that these differences reflect genuine biological differences in the species of treponemes

It has been our experience, however, that in virtually all hamsters inoculated intrascrotally with rabbit virulent syphilis, yaws, or bejel spirochaetes, motile treponemes can be demonstrated by darkfield examination of the inguinal lymph nodes

The data on the results of hamster inoculation are given in table I

TABLE I RESULTS OF INOCULATION OF HAMSTERS WITH NEWLY ISOLATED STRAINS OF SYPHILIS, YAWS, AND BEJEL TREPONEMES

Species of treponeme	Total showing lesions		Total with darkfield positive lymph nodes	
	number inoculated	*number positive*	*number examined*	*number positive*
Syphilis	31	7	23	22
Yaws	42	36	13	12
Bejel	36	33	7	7

Immunogenic Relationships

Cross-immunity studies have been made by infecting rabbits intratesticularly with the Nichols strain of *T. pallidum* and, after about four months, when their immunity to reinfection with their homologous strain is high, challenging them by intracutaneous inoculation with one of the newly isolated strains The Nichols immune animals were ordinarily inoculated

TABLE II RESULTS OF CHALLENGE INOCULATIONS OF RABBITS IMMUNE TO NICHOLS STRAIN OF TREPONEMA PALLIDUM

Group	Strain	Results * in	
		immune rabbits	*control rabbits*
Syphilis	Bosnia A	0/4	4/4
	Bosnia B	0/4	4/4
	Chicago	0/3	4/4
	Baghdad A	0/2	3/3
	Baghdad B	0/4	4/4
Bejel	Syria A	0/4	3/4
	Syria B	0/4	4/4
	Iraq B	2/4	4/4
	Iraq B	2/4	4/4
	Iraq B	2/5	4/4
	Iraq B	1/4	4/4
Yaws	Haiti A	2/4	4/4
	Haiti B	1/4	4/4
	Indonesia B	0/4	3/4

* The first figure in these columns indicates the number of rabbits developing lesions after intracutaneous inoculation the second the number inoculated and surviving the observation period

in groups of four, along with appropriate controls , 5,000 treponemes at each of four sites was the challenge dose regularly employed

The results of these experiments are shown in table II It will be noted that, with the method used, the Nichols strain induced a good cross-immunity to all the newly isolated syphilis strains, with somewhat less clear-cut results in the bejel and yaws groups These experiments are being continued, but it is already apparent that substantial degrees of cross-immunity exist among most of these strains Even in those " immune ' animals that developed lesions following challenge inoculations, the lesions were always fewer in number or smaller than those in the control rabbits In a few tests, not shown in the table, a challenge dose of 500 treponemes was used, with essentially the same results as those obtained with the larger inoculum

In addition, three syphilis strains, Baghdad A, Baghdad B, and Chicago, have been tested with the quantitative immobilization test against " standard" pools of syphilis-, yaws , bejel , and cuniculi immune serum , essentially the same degree of immobilization was observed as that found for the Nichols strain

As indicated previously, we have not been able to obtain satisfactory material for immobilization tests from most of our yaws and bejel strains because of in vivo sensitization developing during the prolonged incubation period

Penicillin Sensitivity of Newly Isolated Strains

Despite the fact that many species of micro-organisms vary in their sensitivity to penicillin and other antibiotics, it is generally assumed that different species of *Treponema* and different strains of the same species have the same range of susceptibility Actually, there is virtually no information on this point in the literature, the only in vivo tests previously reported with virulent treponemes being a few experiments made with the Nichols strain [1, 3, 6, 12]

We have been attempting to test the penicillin sensitivity of our newly isolated strains by both in vivo and in vitro techniques The in vivo test, which has been previously described,[15] consists essentially of inducing intracutaneous syphilomas in rabbits and determining the proportionate decrease in treponemes in these lesions following a given dose of penicillin by counts before treatment and 24 hours after treatment Two hundred oil immersion fields are counted at each period only those animals with pre-treatment counts of 200 treponemes or more in 200 fields are used, and the end point for the post treatment counts is taken as 10 treponemes per 200 fields

Applying this method to the Nichols strain, it is found that a total dose of aqueous crystalline penicillin G of 0 25 mg/kg of body weight of rabbit given in three equal doses at two hour intervals will regularly reduce the

count 24 hours after treatment to 10 or fewer treponemes per 200 fields while one fifth of that amount, or 0.005 mg per kg, will rarely reduce the count to this level

Because of the difficulty of producing satisfactory lesions with the yaws strains, in vivo tests have been made only on the syphilis and the Syria bejel strains The results thus far indicate that these strains respond satisfactorily to the larger dose and appear, therefore, to be just as susceptible to penicillin as the Nichols strain The studies are not yet adequate to indicate whether these strains are substantially more susceptible than is the Nichols strain

TABLE III COMPARATIVE IN VITRO SENSITIVITY OF STRAINS OF TREPONEMA PALLIDUM T PERTENUE AND BEJEL TREPONEMES *

Strain	Number of assays	Average IC_{50} ** (μg)
T pallidum		
Nichols	10	0.0019
S 10	2	0.0013
Chicago	2	0.0019
Baghdad A	4	0.0038
Baghdad B	3	0.0031
Bosnia A	2	0.00[illegible]3
Bosnia B	2	0.0012
T pertenue		
Haiti A	2	0.0015
Haiti B	3	0.0027
Bejel treponemes		
Iraq B	4	0.00[illegible]1
Syria A	3	0.00[illegible]3
Syria B	2	0.0022

* From E E Nell (personal communication)
** IC_{50} — concentration (μg/ml) of penicillin producing 50% immobilization

In vitro tests have been made by our associate, Miss Ellen E Nell on all the newly isolated strains except Indonesia B The results, which are shown in table III, indicate that each of these strains has approximately the same degree of sensitivity as the Nichols strain of *T pallidum* While in most antibiotic assays a twofold variation in the sensitivity of the test is to be expected, we have not been able to reduce the variation within the same strain of treponeme to less than threefold

Experiments recently carried out by Hollander, Turner & Nell[8] are of interest in this connexion Rabbits were infected with the Nichols strain of *T pallidum* and then given repeated subcurative doses of penicillin sufficient to prevent the occurrence of lesions for as long as 20 weeks Upon discontinuance of penicillin, lesions developed within approximately the expected incubation period , and the disease picture evolved in roughly the usual manner In other words the reaction of the host had not been substantially modified by this long-continued subclinical infection and there was no indication that the treponemes developed penicillin resistance

Discussion

These studies might appear at first glance to be only slightly related to the problem of yaws control in the field Actually, they deal with questions that are basic to the whole problem Can we, with scientific justification, translate various features of the control programme directed against syphilis or bejel into terms of yaws control ? Is a treatment scheme that is effective in the control of yaws in one area of the world likely to be an effective form of yaws treatment in some other area ? Will the widespread use of penicillin give rise to resistant strains of treponemes, and, if so, what other forms of therapy will be required for the control of these diseases ?

Despite the increasing amount of penicillin that has been used during the past five to ten years, there is happily no clinical indication that *T pallidum* is developing resistance to this drug On the other hand, there is no assurance that increasing resistance would be readily detected clinically In view of the relative simplicity of in vitro tests for penicillin resistance in treponemal organisms, it would seem wise to check current strains from time to time with reference to penicillin sensitivity against strains isolated in the pre penicillin era

The control of yaws is not only a great humanitarian enterprise, but it is an activity that will pay handsome dividends in terms of economic and social benefits, for this disease lies with a crushing weight on some of the most potentially productive areas of the world Moreover, the development of effective programmes of treponematosis control will lead to health benefits of a more general nature These programmes, calling as they do for the co-ordinate utilization of the techniques of public health administration, medical care, epidemiology, public health nursing services, laboratory facilities, and health education, are admirably suited to serve as a framework around which to build more effective, generalized health-services

ACKNOWLEDGEMENTS

We are greatly indebted to many individuals who have collaborated in sending us materials of various sorts from the field The stud es have been made possible through

some financial support from the World Health Organization and basic support of studies on the biology of spirochaetal infections by the National Institutes of Health of the United States Government and the Whitehall Foundation of New York

SUMMARY

Various recent laboratory studies on the treponemal diseases, carried out both by the authors and by other workers, are reviewed Previous comparative work on *Treponema pallidum*, *T pertenue*, and *T cuniculi* had shown that these organisms have many common characteristics, including a degree of immunological reciprocity More recent investigations using the treponema immobilization test show a significant immunogenic difference between cuniculi strains and those of syphilis or yaws, but no substantial difference between the latter two However, these studies were limited to a few strains which had been separated from their natural hosts for 10–15 years It was therefore decided to carry out similar studies on a large number of more recently isolated strains

Altogether, 12 strains of syphilis, bejel, or yaws, from various parts of the world, were isolated in 1950–1, and both rabbits and hamsters have been inoculated with them The syphilis strains have, in general, produced in rabbits large and indurated lesions similar to those produced by other previously isolated strains The yaws inoculations have also followed the usual pattern of a rather long incubation period with the development of lesions much less indurated and less extensive than those produced by syphilis The effect of the bejel strains seems to be somewhere between the other two groups

Recent experiments with hamsters have shown that inoculation of yaws and bejel

RÉSUMÉ

Divers travaux de laboratoire exécutés récemment par l'auteur et d'autres spécialistes sont passés en revue Il résulte d'études comparatives faites précédemment sur *Treponema pallidum* *T pertenue*, et *T. cuniculi* que ces spirochètes possèdent de multiples caractères communs et confèrent notamment un certain degré d'immunité croisée Des recherches plus récentes, fondées sur le test d'immobilisation du tréponème, ont montré qu'il existe une différence appréciable entre les propriétés immunogènes des souches de *T. cuniculi* et celles de la syphilis ou du pian, mais pas de différence notable entre celles de ces deux dernières tréponématoses Ces études ont toutefois porté sur un nombre restreint de souches, qui n'avaient pas été en contact avec leur hôte naturel depuis 10 à 15 ans Il a donc été décidé d'entreprendre des recherches analogues sur de nombreuses souches isolées à des dates plus récentes

Au total, douze souches de syphilis, de béjel ou de pian, provenant de différentes régions du monde, ont été isolées en 1950–51, et inoculées à des lapins et à des hamsters D'une façon générale, les souches de syphilis ont provoqué chez les lapins des lésions indurées de grandes dimensions, analogues à celles qu'avaient produites des souches isolées précédemment Les inoculations de tréponèmes du pian ont également abouti aux résultats habituels période d'incubation assez prolongée et apparition de lésions beaucoup moins indurées et moins étendues que celles de la syphilis Quant aux souches de béjel, elles ont produit des effets qui se situent, semble-t il, entre ceux des deux autres groupes

Des expériences récentes sur le hamster ont montré que des tréponèmes du pian

strains into the skin of the scrotum or lip generally produces more extensive lesions in a higher proportion of animals than do syphilis strains Intrascrotal inoculation of rabbit virulent syphilis yaws or bejel spirochaetes is almost invariably followed by the appearance of motile treponemes in the inguinal lymph nodes

Cross-immunity studies made by infecting rabbits intratesticularly with the Nichols strain of *T pallidum* and challenging by intracutaneous inoculation of one of the more recent strains showed that the Nichols strain induced a good cross immunity to all the syphilis strains tested with less clear-cut results in the bejel and yaws groups Substantial degrees of cross immunity exist among most of these strains

Since there is virtually no information to show that different species or strains of treponemes have the same range of sensitivity to antibiotics the author has attempted to test the penicillin sensitivity of the recently isolated strains In vivo tests on the syphilis and Syria bejel strains indicate that they appear to be just as susceptible to penicillin as the Nichols With the exception of the Indonesia yaws strain all the strains were also tested by the more sensitive in vitro method, and none seemed more resistant to penicillin than the Nichols

Other experiments involving long continued subclinical infection of rabbits with the Nichols strain have given no indication that the treponemes develop resistance to penicillin Nor does evidence from the field give any such indication despite the increasing amount of penicillin used in recent years However since there is no assurance that such evidence would be readily detected clinically the author considers that it would be wise to check periodically for penicillin sensitivity current

et du béjel inoculés dans la peau du scrotum ou de la lèvre produisent généralement des lésions plus étendues et chez un plus grand nombre d animaux que les spirochètes de la syphilis A la suite de l infection scrotale au moyen de tréponèmes de la syphilis du pian ou du béjel virulents pour le lapin on trouve presque toujours des spirochètes mobiles dans les ganglions inguinaux

Des expériences d immunité croisée ont été instituées en recourant à l infection intratesticulaire de lapins au moyen d une souche Nichols de *T pallidum* la souche d epreuve etait une des souches plus récentes inoculée par voie intradermique ces expériences ont montré que la souche Nichols donne nettement une immunité croisée à l égard de toutes les autres souches de syphilis utilisées les resultats etant cependant moins concluants pour les groupes du béjel et du pian Il existe entre la plupart de ces souches une immunité croisée notable

Étant donné qu on ne possède pratiquement pas d information permettant d affirmer que diverses espèces ou souches de tréponèmes sont au même degré sensibles aux antibiotiques l auteur s est efforcé de déterminer la sensibilité à la pénicilline des souches recemment isolees D après des épreuves in vivo des souches de syphilis et des souches syriennes du béjel paraissent tout aussi sensibles à la pénicilline que la souche Nichols A l exception de la souche indonésienne du pian toutes les autres souches ont été également soumises à des epreuves par la méthode in vitro plus sensible et aucune n a paru être plus résistante à la pénicilline que celle de Nichols

D autres experiences basées notamment sur le maintien prolonge chez des lapins d une infection sub-clinique provoquée par la souche Nichols n ont rien révélé qui puisse indiquer une pénicillinorésistance chez les tréponèmes Aucune observation clinique n a éte faite dans ce sens malgré la quantité croissante de pénicilline utilisee au cours des dernières années Etant donne toutefois qu il n est pas certain que la clinique puisse révéler de tels faits l auteur estime qu il serait

strains against strains isolated before the advent of that drug

In conclusion, he advocates continued and thorough research on the treponematoses and on methods for their control, not only in view of the economic and social benefits such control would bring about, but also because control programmes against these diseases may serve admirably as a framework around which to build more effective general health services

indiqué de contrôler periodiquement la sensibilité à la pénicilline des souches courantes en les comparant à des souches-témoins isolees avant l introduction de ce remède

En conclusion, l'auteur souligne la nécessite de poursuivre avec continuite et rigueur les recherches sur les tréponématoses et les moyens de les combattre, en effet, les programmes de lutte contre ces maladies apporteraient non seulement des avantages économiques et sociaux, ils constitueraient aussi une excellente base de départ pour creer des services généraux de santé publique d'une plus grande efficacite

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NON-SPECIFIC FACTORS IN THE EPIDEMIOLOGY OF YAWS

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Any infection implies the interplay of three factors the host, the environment, and the parasite, and epidemiology, which is strictly the study of epidemics, also involves the interplay of those factors within a community The specific factor in the epidemiology of yaws, I take to be the etiological or causative agent, the *Treponema pertenue* It is probable that the host and environment have a direct part to play on this treponeme, producing such changes as mutation, variation, and adaptability These changes may or may not be the cause of certain differences in the clinical manifestations of yaws found from time to time or from place to place, or even may or may not be the cause of the differences between the various treponematoses, such as syphilis, yaws, bejel, pinta, etc In this paper, however, I will not discuss such controversial subjects but will confine myself to a discussion of the various factors involving the host and his environment These I consider to be the non specific factors in the epidemiology of yaws, such factors may alter the incidence and appearance of the disease but are not its cause

Geographical Distribution

The countries in which the disease is prevalent in South America are the Guianas, Venezuela, Bolivia, Colombia, and most of Brazil In Central America, the disease is present in Guatemala Honduras, Costa Rica and Panama, although the incidence there is low, but in the West Indian islands—Jamaica, Haiti Trinidad, and the others—yaws is common

Passing to Africa, one finds the disease very prevalent on the west coast, and in Uganda, Kenya, Tanganyika, and Madagascar In Asia it is found in the Indian districts of Bengal and Travancore and in Assam Burma, and Ceylon It is very common in Thailand and Indo China, and is also found in southern China and Taiwan (Formosa) The disease

is common in the Malay archipelago and in the Indonesian territories Finally, it is found in the north of Australia and in the islands of the South Pacific—Fiji, New Hebrides, etc

Temperature and Altitude

From this survey it would appear that yaws flourishes best in countries which lie approximately within the tropics about the mean annual isotherm of 80°F (27°C) and over Although yaws may flourish in countries lying between isotherms of 70°F and 79°F (21°C and 26°C), the reported incidence there is definitely lower than around the isotherm 80°F In Mexico, Cuba, Ecuador, Peru, and Chile, the reported incidence is low There are, however, areas in which the temperature varies between 79°F and 90°F (26°C and 32°C) and yet yaws is very common—for example, Madagascar, Burma, and Assam—but these places, possibly because of their proximity to the sea, have little fluctuation in their mean annual temperature, and furthermore they have, as I will mention later, a heavy annual rainfall

In Burma and Assam the incidence is highest in those sections which are towards the 80°F isotherm Thus Jolly [14] reports that in Burma the disease is mainly confined to the country west of the Irrawaddy, this country is nearest the sea and approaches the 80°F isotherm In lower Burma the disease is infrequent in the delta region but common along the Tenasserim coast, which is within that isotherm He states that the same conditions apply in Assam and that yaws is most prevalent in that part of the Lower Chindwin area which is towards the 80°F isotherm

The disease apparently does not thrive in colder climates or in climates where there are extremes of temperature There was ample opportunity for it to be carried from the tropics to more temperate climes during the first, and especially the second, World War, and yet the few cases which were reported did not give rise to any known infectivity and were soon cured

stated that yaws did not occur in the mountains or at a higher level than 800 feet (250 m) Ramsay,[30] on the contrary, has found that yaws is more prevalent in the hills of Cachar, Assam, at heights of 1 000-5,000 feet (300-1,500 m) above sea level than on the plains of that district

There are districts in Jamaica where the altitude is 1,800-2 300 feet (550-700 m) above sea level and where, according to Chambers,[6] the incidence of yaws was 57% of the population Oho [25] has reported on an area of yaws infection in the southern tip of the island of Formosa at an altitude of 5,000 feet (1,500 m)

There are several reports that a lower temperature will alter the character and distribution of the yaws lesions In the Cachar district of Assam, the average summer temperature is 83°F (28°C) and the average winter temperature is 65°F (18°C), the mean average rainfall is 100 inches (260 cm) Ramsay [30] states that on the plains in the summer the lesions are of the typical florid variety, but that during the winter months it is a very rare occurrence to see framboesial patients presenting typical yellow-encrusted excrescences, in the latter season, what are usually seen are condylomatous lesions in the warm, moist regions of the axilla and between the nates chronic dermatitis of the hand, desquamating lesions with a worm-eaten appearance, of the soles of the feet, and occasional painful joints—all liable to be mistaken as syphilitic As soon as the weather becomes warmer the characteristic yellow encrusted yaws may reappear with, on the advent of the rainy season, the painful plantar lesion Ramsay goes on to say

syphilis

Further, Ramsay notes that the incidence of tertiary lesions is much higher in the cooler hills than in the warmer plains Climate does not explain this, and he attributes it to a possible cross immunizing effect by the malaria which is much more prevalent in the plains

Lopez Rizal & Sellards [19] reported that yaws was widespread in Luzon Philippines In the areas which had an altitude of 600-2,100 m (approximately 1,950-7 000 feet) the lesions were confined to the mucocutaneous junctions at the mouth, nose, anus, and genitalia The point here is that it is perhaps due to the colder atmosphere that the treponeme of yaws can find a footing only in these warm, moist areas of the body This viewpoint has been taken up by Hudson,[12] and although I do not, in this paper wish to enter into any controversial argument as to whether syphilis and yaws are the same disease or two distinct diseases there is some evidence that *treponematosis is prevalent in a non venereal form as yaws in the tropics*, whereas in colder climates it may change its form and be nurtured as it were, by the warmer and moist conditions of mucocutaneous sites of infection and, perhaps by venereal transmission

Rainfall

The high incidence of yaws within the tropics appears to be intimately bound to a heavy rainfall If we consider a map of the world giving the annual rainfall, it will be seen that, in general, the heavy incidence of yaws corresponds with those areas where the rainfall is more than 50 inches (1,300 mm)[12] It will be remembered that the incidence on the west coast of South America and in the Sahara Desert, Africa, is either nil or very small, this corresponds to a low annual rainfall

It is interesting to compare the rainfall map of India with one showing the distribution of yaws No yaws cases, or very few, are reported from the former Central Provinces or from Hyderabad, Madras, or Mysore, whereas the incidence in Bengal, Assam, and Burma, which are almost in the same latitude, is very high This is because the former are dry areas in the wake of the summer monsoons which proceed in a north westerly direction towards the latter, where the rainfall is heavy

It is well known that there is an increase in the number of cases of yaws during the rainy seasons, this is made up of an increase in new cases or reinfections and of a higher relapse rate of old cases

Further, Saunders et al [33] in Jamaica reported striking differences in the lesions during the wet and dry seasons In the rainy season a greater proportion of cases showed an open infectious type of lesion, and the papillomatous framboesides tended to be larger, more numerous, and florid During the dry season, they noticed that the papillomatous fram boesides appeared to be localized more in the warm, moist parts of the body, and the early eruptions were frequently of the dry, scaly, maculo-papular type These differences were so striking that Kumm who was working on *Hippelates pallipes*, and who required moist papillomatous framboesides, always chose to work with the treatment team operating in a rainy district The increase in the number of papillomatous framboesides is illustrated by the following data, taken from Saunders et al ,[33] which show the average monthly rainfall, in inches, for a 3 month period in 10 treatment areas and the percentage of persons with papillomatous framboesides among the total number of persons who had had yaws for less than 5 years

Area	*Average monthly rainfall (inches)*	*Total cases of yaws*	*Papillomatous framboesides (%)*
1	2 05	284	7 8
2	5 08	487	17 6
3	6 65	333	17 7
4	7 07	250	15 2
5	9 17	344	29 2
6	10 90	392	31 0

Area	*Average monthly rainfall (inches)*	*Total cases of yaws*	*Papillomatous framboesides (%)*
7	15 41	314	22 3
8	21 51	317	30 9
9	27 09	409	37 7
10	40 49	342	33 9

This increase is well known to the people of Jamaica, and in Indonesia there is a saying that the incidence of plantar lesions is increased " when the bamboo shoots come out ", i e , during the rainy season (R Kodijat —personal communication, 1950)

I will return to the discussion of the relation of heavy rainfall to the incidence of yaws in a locality later, when I discuss humidity

Fig 1 shows the distribution of yaws in Jamaica and fig 2, the average annual rainfall, it will be seen that, in general, areas showing a high prevalence of the disease correspond to the areas of heavy rainfall, and that where there is little rainfall there is never any high incidence of the disease

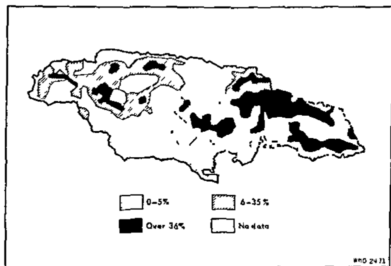
Geological Formation

Although the disease is prevalent in rainy districts, it should be noted that a heavy rainfall in the tropics does not necessarily mean a high incidence of yaws For example, Chambers [5] reports on three districts in Jamaica, separated from each other by only a few miles, the relevant data on each district are as follows

District	*Altitude (feet)*	*Rainfall (inches)*	*Yaws incidence*	*Soil characteristics*
Duncans	300	80	nil	well drained limestone no tenacious topsoil
Duanvale	800	51	high	swampy limestone marly alluvium (holds water)
Devon	2 500	73	nil	well drained limestone no tenacious topsoil

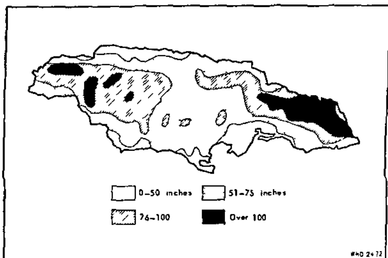
The prevalence of yaws in Duanvale, then, appears to be due to the fact that the water is unable to drain away owing to the marly alluvium, in the other two districts the topsoils are sandy and the water is able to seep away through the limestone In general, the dampness of the soil will be increased when the soil is impervious when the drainage is poor, when there is seepage from watersheds and a persistent high subsoil water-level, and when evaporation is limited as is the case in sun starved valleys or in areas of dense foliage

FIG. 1 DISTRIBUTION OF YAWS IN JAMAICA *



* From Saunders et al [24] (by permission of the editors of the *American Journal of Hygiene*)

FIG. 2 AVERAGE ANNUAL RAINFALL IN JAMAICA *

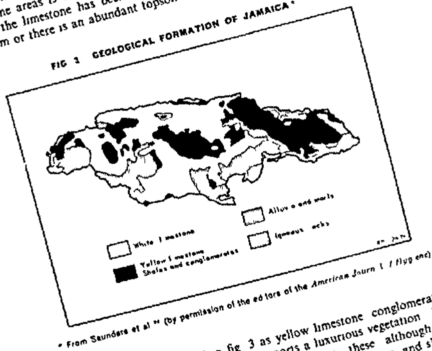


* From Saunders et al [24] (by permission of the editors of the *American Journal of Hygiene*)

Fig 3 shows the various geological formations in Jamaica, and a comparison with fig 1, which shows the distribution of yaws, demonstrates a marked correlation between the heavier geological formation in Jamaica and the incidence of yaws

One noticeable feature is that yaws is least prevalent in areas where white limestone is present, such areas have scanty soil, are pervious to water, and have sparse vegetation Only in one or two places in the white-limestone areas is there any high incidence of yaws, and in these cases either the limestone has been cut through to an underlying impervious stratum or there is an abundant topsoil

FIG 3 GEOLOGICAL FORMATION OF JAMAICA *



* From Saunders et al (by permission of the ed tors of the *American Journ l f Hyg ene*)

The formation indicated in fig 3 as yellow limestone conglomerates and shales is not very pervious and supports a luxurious vegetation The alluvial soils and marls represent fertile deposits, these although less impervious to water than the yellow limestone, conglomerates and shales, hold moisture better than white limestone, and show and support a luxurious vegetation Both types of formation supporting a luxurious vegetation show a high incidence of yaws

Thus, then, it is evident that yaws is prevalent in areas with a high rainfall except where there is a pervious limestone formation and also —this follows from the geological formation of the topsoil—where there is ample vegetation

Humidity

From the foregoing observations, it can be seen that the three last mentioned factors affecting the incidence of yaws, namely, rainfall, geological formation, and vegetation, may be crystallized into a single factor—moisture content or humidity

An example of this is given by Chambers [5] who describes two districts with the same elevation, rainfall, soil, seepage from watersheds, and standard of living and in which there was a high incidence of yaws However, in the one which had mountains to the east and west cutting off the hours of sunshine in the morning and evening, the incidence of yaws was about 76%, whereas in the other district the mountains did not interfere with the direct sunshine and the incidence of yaws was about 60% Chambers attributes the difference in incidence to the difference in humidity in the two places

Much speculation has arisen with regard to the association of the high humidity of an area with a high incidence of yaws, and there is a tendency to explain it as a case of cause and effect

It has been said that the treponeme has a relatively longer viability in damp soil and that infection could therefore take place from the ' droppings from sores Harrison [9] claims that *Treponema pallidum* can survive, i e, remain motile, outside the body for as long as two months provided they are kept moist Against this is the generally accepted theory of the fragility of *T pertenue* Yawuyama [44] has shown that *T pertenue* has survived outside the body at 28°F (−2°C) for only 30 minutes in saline and for two hours in human serum Chambers [5] has observed motility of *T pertenue* at room temperature—84°F (29°C)—in serum for 8 hours Furthermore, the fact that very few cases of initial lesions occur on the soles of the feet rather precludes the possibility of infection from droppings In passing, it may be mentioned that investigations into the pH of the soil in Jamaica have shown no correlation of pH with the incidence of yaws [5]

A high moisture content or humidity is responsible for a sogginess of the skin and an increase in the incidence of skin infections from fungi and other organisms Such infections interfere with the integrity of the skin surface, either directly or indirectly due to scratching, so that it would be possible for a treponeme placed in the skin to gain ingress and to cause a yaws infection

A further explanation commends itself It is well known that the incidence of plantar yaws increases during the wet season This is due not to initial infection in the plantar region but rather to re exacerbation of the disease there Such lesions (ulcerative plantar framboesides) are infectious and will be a source of new infection to non immune persons

Why there should be exacerbation of the disease is unknown, it has been suggested that the sole becomes soggy and that treponemes lying dormant in the tips of the papillae and in the epidermis are stimulated to produce active lesions This is of importance as it may be the source of the continuation of infection in the community

At this point, it may be as well to digress and study the course of the disease in a patient After the initial infection, the patient shows various manifestations of the disease for many years afterwards, such manifestations are usually described as the secondary and tertiary stages of the disease These waxing and waning recrudescences of the disease generally cease to be infectious within 2 or 3 years, and certainly not more than 4 years, after the initial infection By "infectious" I mean that treponemes can be demonstrated in the matter from the lesions by means of the darkfield microscope Later outbreaks are non infectious except for one type of lesion, the ulcerative plantar lesion or crab yaw, which may appear many years after the initial infection

An example of this is given by Chambers[6] who is a supporter of the theory that the plantar lesion is a potent source of reinfection in a community A series of 682 patients with lesions (249 infectious and 433 non infectious) was kept under observation for a period of about two and a half years At the end of that period there were 70 cases with relapsing lesions —62 non infectious and 8 infectious The 8 infectious lesions were all ulcerative plantar lesions

From this example and many others studied by him Chambers believes that infectious lesions, other than plantar or palmar, represent a definite stage in the course of the disease and seem to recur but rarely when the maximum time for that stage has been passed On the other hand plantar and palmar lesions follow a less clearly defined course and occur many years after the first attack, often concurrently with the so-called tertiary and non infectious stage of the disease The principal factor in the production of plantar lesions appears to be a soggy condition of the sole which transforms a dormant organism into an active one Such soggy conditions of the plantar surfaces and re-exacerbation of the disease are found in hot damp climates and may explain the continuation of the infection within the community generally as well as the increased incidence during the rainy season I will return to this aspect later

That humidity is a factor is illustrated by an example from a publication by Scott[37] who describes an outbreak of yaws among adult labourers in one of the Johannesburg mines, surface workers were not affected and the majority of those who were affected belonged to one shaft This shaft was 1 000-2 000 feet (300-600 m) below sea level and the dry bulb thermometer varied between 88°F and 92°F (31° 33°C) Primary lesions were seen on every part of the body except the feet and ankles, all the men wore boots Johannesburg (26°S) is at an altitude of 6 000 feet (1 800 m)

Economic Status and Sanitary Conditions

Before turning to a discussion of the actual mode of infection it will be as well to discuss the economic circumstances and sanitary conditions of the people affected by yaws

Yaws appears to be endemic where the standard of living is low, and where there is overcrowding and lack of proper sanitation and facilities for personal hygiene, these circumstances are the same for any contagious disease Turner & Saunders [43] have found that yaws in Jamaica is more prevalent among the lower classes of society than among the higher, and Saunders et al [34] have shown that yaws incidence increases as the sanitary status of the home decreases However, yaws is not always present in communities where sanitary conditions are poor and from this we must conclude that sanitation and hygiene are not the only factors in the causation of the disease

It has been shown [43] that yaws is a rural disease rarely found in urban areas Saunders et al [34] studied two districts for incidence of yaws in urban and rural areas The incidence of yaws in the age-group 10 14 years was about 50% in the country areas and 26% in the town areas although the standards of sanitation and hygiene were about the same These authors conclude that the difference in incidence may be due to the fact that in the country there are extensive areas of vegetation (bush) which (*a*) increase the chances of injury to legs and feet and therefore of liability to infection and (*b*) prevent drying thereby increasing the humidity

Another factor which may be relevant is that town people in general wear shoes much more than country people and are better clothed An interesting example of the protective effect of footwear was given in Burma when the Eighth West African Division retreated from the Arakan in 1944 The soldiers during the retreat found their boots too heavy, so they threw them away, the monsoons were starting and an epidemic of foot yaws ensued [7] In a personal communication (1952), Findlay states that 60% of the cases were of the crab yaw variety (ulcerative plantar framboeside)

It is evident that yaws declines with the rise of socio economic status as judged by Western standards—that is to say, when more clothing and footwear are worn, when standards of personal hygiene and sanitation are more rigorous and when houses have covered floors and communications are paved

Diet

The connexion between dietary deficiency and yaws incidence is not apparent It is known that dietary deficiencies such as low protein intake and avitaminosis are common in the tropics, but whether or not a dietary

deficiency makes a patient more prone to yaws infection is unknown In investigations of a total child population of 280 children under the age of puberty in a village in the Gold Coast, Findlay[7] found that only 3 8% of the 233 children without signs of yaws had evidence of avitaminosis, whereas 14 8% of the 47 children showing lesions of yaws had marked signs of food deficiency

Chambers[5] brings out the fact that in general the inhabitants of areas in which yaws is endemic are underfed, he points out, however, that inhabitants in such areas are better off agriculturally than are the inhabitants in the "rain starved" areas, where both yaws and agriculture are limited because of the poor rainfall and pervious soils Bloss[1] has stated that yaws is more common among the pastoral Nilotic tribes of the Anglo Egyptian Sudan than among the agrarian Zande The former can be regarded as "blood and milk" eaters whereas the latter are vegetarians He suggests that the difference in the incidence of yaws may be due to diet, but there are several other factors at play in two such widely different groups

Race

Spittel[39] has stated that yaws hardly ever attacks the European or, for that matter, any cleanly living individual, whatever his race, however, da Silva Araujo[35] gives the following figures for the northeastern province of Brazil out of 30,000 cases of yaws in a population of one and a quarter million, negroes formed 15 2%, half-castes 56 2%, Indians 10 2%, and "whites" 18 4%.

There appears to be no racial immunity to the disease, and given the same circumstances, such as poverty and unhygienic and insanitary surroundings, any racial type will be affected in an endemic area It would be as well to add however, that Hewer[11] found syphilis among the inhabitants of northern Sudan and yaws in the southern part of that area, the difference in clinical types he attributed to race although climatic factors could not be excluded

Sex

There appear to be rather more males than females who acquire the disease Chambers[5] states that in one series of 641 cases seen with primary lesions, 372 were males and 269 females The majority of these cases were between 5 and 14 years of age, and the explanation given is that boys are much more active than girls and therefore suffer more traumata, further girls of school age are usually better clothed than boys of the same age, and this is possibly a protective factor which would tend to reduce the incidence of yaws in the female

In Jamaica, it is only during the ages of 20 to 29 years that female cases preponderate to the extent of 5 3, according to Chambers [5] The ages of *20 to 29 years* correspond to the period of greatest child bearing and therefore of the most frequent handling of children, so that the opportunities of acquiring the disease are increased Findlay [7] confirms these findings in West Africa Table I gives the sex distribution of yaws, according to age groups, in the Bath area, Jamaica, as found by Turner & Saunders [43]

TABLE I DISTRIBUTION OF YAWS ACCORDING TO SEX AMONG SUCCESSIVE AGE GROUPS IN THE BATH AREA JAMAICA *

Age group (years)	Sex	Number of persons	Cases of yaws	
			number	%
Under 5	Male	164	41	25 0
	Female	168	47	28 0
5 9	Male	165	99	60 0
	Female	176	91	51 7
10 14	Male	134	111	82 8
	Female	156	107	68 6
15 19	Male	123	95	77 2
	Female	114	79	69 3
20 29	Male	263	190	72 2
	Female	258	154	59 7
30 39	Male	187	113	60 4
	Female	183	108	59 0
40 49	Male	116	71	61 2
	Female	105	52	49 5
50 59	Male	70	38	54 3
	Female	68	32	47 1
60 and over	Male	58	40	69 0
	Female	60	28	46 7
Total	Male	1 280	798	62.3
	Female	1 288	698	54 2

* From Turner & Saunders [43] (by permission of the editors of the *American Journal of Hygiene*)

It will be seen that males preponderate at almost all ages, although the incidence tends to be approximately equal among males and females under 5 years of age and between 30 and 40

Age

The incidence of yaws in relation to the age groups in the community can be studied under two headings (1) the age at onset of the disease, and (2) the total number of cases giving a history of yaws, classified according to age

As regards the age at onset, Chambers,[5] in Jamaica, found that the incidence of primary lesions reached its peak between the ages of 5 and 9 years, with the next most frequent incidence between the ages of 6 months and 4 years Out of 580 cases with primary lesions, only 2 were found below the age of 6 months, and those were 4 and 5 months old respectively

TABLE II AGE AT ONSET OF YAWS IN BATH AND SEAFORTH AREAS JAMAICA *

Age at onset (yea s)	Eath area		Seaforth area	
	numbe	%	numbe	%
Under 5	479	35 3	147	27 6
5 9	543	40 5	254	47 5
10 14	213	15 7	85	15 9
15 19	59	4 4	32	6 0
20 29	38	2 8	1	2 0
30 39	12	0 9	3	0 6
40 49	6	0 4	2	0 4
50 and over	0		0	
Total	1 356	100 0	534	00 0

* From Turner & Saunders[43] (by permission of the ed tors of the *American Journ l of Hygiene*)

Turner & Saunders[43] also studied the disease in Jamaica and found in investigating the histories of about 2,000 patients that the greatest number became infected for the first time in the second 5 year period of life, and that 90% of them were infected before the age of 15 years Less than 5% gave a history of having acquired yaws for the first time after the age of 20 Turner & Saunders' figures are given in table II

Findlay,[7] reporting from West Africa, put the peak incidence at between 2 and 5 years of age with a gradual decline towards puberty He states that yaws is rare before the age of 18 months

To sum up, most observers find the peak age-incidence of the initial infection to be in the years during childhood up to puberty These years are, of course, the years of greatest activity and consequently of the greatest injury to the skin

I shall leave discussion of the total number of cases giving a history of yaws, within a community classified according to age-groups, until we come to the question of immunity

Site of Infection

The commonest site for the initial lesion is the lower leg, and this corresponds to the site of the greatest frequency of traumata for inhabitants in the country districts As has just been mentioned children are the most affected and they constitute the age groups which are not so well clothed and, in play, sustain injuries to the lower limbs

According to Chambers,[5] in a survey of over 2,000 cases, the commonest site of infection was the feet and ankles (infection on the sole was very rare), and the next commonest was the legs and knees About 75% of all cases were infected on the legs below the knee The third place in order of frequency was the head and neck, and the fourth, the thighs and buttocks Less than 3% of the initial lesions were found on the genitalia Moss & Bigelow,[23] in histories obtained from 968 cases, found that the ankles were *the commonest site for the initial lesion, and Turner & Saunders* [43] *found* the location of the initial lesion in 1,096 cases to be as follows

Legs and feet	75 5%
Head and face	12 5%
Upper extremity	7 0%
Thighs and buttocks	4 0%
Genitalia	0 8%
Other locations	0 2%

On the Gold Coast, however, it was found that out of 100 consecutive cases investigated, the initial lesion was on the buttocks, perineum, and thighs in no fewer than 57 cases [7] This was attributed to the fact that the parts of the body in contact with the ground when the patient is sitting are the areas most commonly affected

Mode of Infection

Now let us turn to the consideration of the modes of infection, these may be listed as follows

(1) by contact between humans,
(2) by an insect vector,
(3) by congenital acquisition,
(4) by other sources

Contact

It is almost universally considered that the commonest mode of infection is by contact between individuals The actual mode of infection is the depositing of the treponeme, contained in the pus from open sores, on to the skin of a non immune person so that the treponeme gains ingress and sets up a new infection In support of this theory of contagion is the fact that the peak age for the initial acquisition of the disease is the years of childhood before puberty, when, as is to be expected, children in play come together without regard for the niceties of sophisticated behaviour and when, as a consequence of violent activities, breaches in the skin from injury are to be expected much more frequently than in higher age groups In addition, children, in whom the disease is commonest, are more scantily clad and do not wear shoes as frequently as their elders

The theory of the contagious nature of the disease by infection through abrasion, is also supported by the fact that the disease is commonest in the country districts where vegetation (bush) would tend to produce minute abrasions on unclothed legs and unshod feet, especially when the latter are associated with a soggy skin—the inevitable result of working in such damp areas

There is little evidence that yaws is transmitted venereally The disease primarily attacks young children, and the incidence of penile primary lesions is variously stated to be about 3% (Chambers [5]) and less than 1% (Turner & Saunders [43])

The fact that yaws is rarely found in urban communities possibly because the paving of streets and the wearing of clothes a necessity for conformity to the social pattern—both tend to prevent abrasion of the skin, supports the argument for the contagious nature of yaws

Whether or not infection can take place through intact skin is a debatable point There is always the possibility, which still remains unproven that treponemes, themselves microscopic in size, may gain access through injuries of microscopic size However, many experiments have been carried out in humans where the disease has been transmitted by direct contact when there has been a trauma of some sort [24, 34]

Insect vectors

The transmission of yaws by flies has been suggested by several authors Robertson,[32] in the Gilbert and Ellis Islands has studied the problem of

Findlay,[7] reporting from West Africa, put the peak incidence at between 2 and 5 years of age with a gradual decline towards puberty He states that yaws is rare before the age of 18 months

To sum up, most observers find the peak age incidence of the initial infection to be in the years during childhood up to puberty These years are, of course, the years of greatest activity and consequently of the greatest injury to the skin

I shall leave discussion of the total number of cases giving a history of yaws, within a community classified according to age-groups, until we come to the question of immunity

Site of Infection

The commonest site for the initial lesion is the lower leg, and this corresponds to the site of the greatest frequency of traumata for inhabitants in the country districts As has just been mentioned, children are the most affected and they constitute the age groups which are not so well clothed and, in play, sustain injuries to the lower limbs

According to Chambers,[5] in a survey of over 2,000 cases, the commonest site of infection was the feet and ankles (infection on the sole was very rare), and the next commonest was the legs and knees About 75% of all cases were infected on the legs below the knee The third place in order of frequency was the head and neck, and the fourth, the thighs and buttocks Less than 3% of the initial lesions were found on the genitalia Moss & Bigelow [23] in histories obtained from 968 cases, found that the ankles were the commonest site for the initial lesion, and Turner & Saunders [43] found the location of the initial lesion in 1,096 cases to be as follows

Legs and feet	75 5%
Head and face	12 5%
Upper extremity	7 0%
Thighs and buttocks	4 0%
Genitalia	0 8%
Other locations	0 2%

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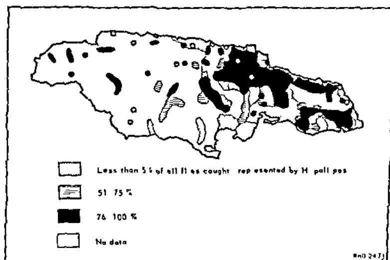
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flies as carriers of yaws, he caught 200 flies which were feeding on yaw lesions, washed them in sterile water, and found the *Spirochaetae pertenui* of Castellani in smears from centrifuged deposits of the washings From this he concluded that flies are potential carriers of the disease, unfortunatel he does not specify in his article the type of fly which he studied

Thomson & Lamborn [41] in Africa have shown that *T pertenue* can pas through *Musca spectanda* which have fed on yaws sores and be deposited in the dejecta, which may, therefore, potentially infect any breach of the skin

Perhaps the best researches are those of Kumm and his colleagues,[15 16 17 1] who have studied the transmission of yaws from man to rabbits by the

FIG 4 DISTRIBUTION OF HIPPELATES PALLIPES IN AREAS SURVEYED FOR FLIES IN JAMAICA *



* From Saunders et al [34] (by permission of the editors of the *American Journal of Hygiene*)

insect vector, *Hippelates pallipes* Loew These workers have shown that *H pallipes* feeds on yaws lesions in enormous numbers, for instance, 673 flies were caught in 15 minutes from one ulcer on a boy's leg If the lesion is covered by a scab, the flies crawl under the scab through any cracks and holes that may be available, I have observed this myself It has been demonstrated on dissection that, after feeding, the fly contains many treponemes, for example, 304 *T pertenue* were found after one minute, 138 after 6 hours and 15 after 18 hours The treponemes have been shown to remain motile up to 7 8 hours in the oesophageal diverticulum and may be regurgitated in the vomit drop Further, Kumm & Turner [17] have shown that after *H pallipes* has fed on a human case, its vomit drop, containing treponemes, has transmitted the disease to rabbits

These authors also point out that *H pallipes* has a decided preference for feeding on the lower extremities, and that the degree of correlation between the distribution of *H pallipes* in Jamaica and that of yaws is most striking, both being most prevalent where there is a high rainfall throughout the year and a luxuriant vegetation (see fig 4) However, it should be noted that *H pallipes* is also common in some localities which have a dense jungle type of vegetation and high rainfall but no yaws

Saunders et al [34] state "We cannot yet decide whether the distribution of *Hippelates pallipes* in Jamaica determines the distribution of yaws or whether both are affected by the same environmental factors causing their distribution to coincide" And that is the position today

Congenital infection

It is the consensus of opinion that yaws is not acquired congenitally Chambers,[5] in a total of 8,000 histories, came across no evidence of congenital lesions or stigmata of yaws Suckling infants in the first year of life are seldom affected by yaws and this may be due to the fact that such children are not subjected to trauma as older children are, and therefore the treponemes would not gain ingress into the skin Further, I have seen many *H pallipes* surrounding the eyes of children in homes where yaws is active, but have only occasionally seen yaws infection of the eye In my experience, the majority of suckling infants affected with yaws have shown their initial lesions in the peroral and oral region

Another reason why newly born infants are apparently unaffected is that they may have some transmitted immunity However, Chambers [5] reports that the serological tests on six infants born to mothers who had received no form of treatment for relapsing yaws lesions during the period of gestation were negative In another case,[4] the mother became infected during the later months of her pregnancy, and the disease was active during and after the birth of the child, nevertheless, the child showed no stigmata or signs of yaws and the serological tests were normal

Mattlet [21] also describes a case of a mother with florid yaws who gave birth to a child with a negative serological titre, and Baermann (quoted by Hermans [10]) found two similar cases in which the child had a negative titre

Admitting that the reagin or complement fixing antibody is not the immune antibody it is hard to understand in the above cases from the literature why the reagin did not pass the placental barrier However, the transmission of reagin from the mother s blood to the baby is a complex problem which is also found in syphilis [40] It is known that in some cases of syphilis the mother may have large amounts of reagin which is not transmitted to the baby, whereas in other cases the maternal reagin may be of low titre and yet the child is serologically positive The reason for this is obscure

A case which came under my observation may be of interest A 22 year-old Chinese girl with florid yaws presented herself when she was six months pregnant Her serological titre was 512 Kahn units, and her initial infection had occurred 3 months previously She received no treatment and was delivered of a premature child 6 weeks before the estimated term The child appeared normal and the cord blood had a titre of 32 Kahn units The placenta seemed normal and was not remarkable histologically, treponemes were not demonstrated Four months after birth the child still had a positive titre although a quantitative test was not made There were no stigmata or lesions of yaws This case is the first I know of in which a positive titre has been reported in an infant delivered from a mother with active yaws, it will be interesting to watch this baby's titre, and to note the possibility of infection or immunity, and/or the development of lesions

Other sources of infection

Sources of transmission of the disease other than those described are probably rare Infection from contamination of objects is unlikely because of the fragility of the organism, particularly its low resistance to drying The possibility of infection from a reservoir in animals is also unlikely, although it cannot be excluded, because the disease has been transmitted, with difficulty, to rabbits, hamsters, monkeys and, I understand, donkeys (Dr F W Aris—personal communication, 1951)

Natural and Acquired Immunity

It is a widely held belief among many native populations that a childhood infection of yaws prevents, or at least mitigates, an infection in adult life So deeply is this belief ingrained in local customs that, sometimes, a mother with an uninfected child will take that child to play with an infected one, so that he may acquire the disease and gain protection I well remember an African who has now attained fame in the Judiciary telling me that he had been taken by his grandmother to a neighbouring village and so infected

Further, the native often refuses treatment for the disease in the initial stage before the florid, so called secondary, lesions have had time to appear, or resists efforts to treat this later stage before it has run its normal course

In Jamaica, at the time of the early and, because uncompleted, somewhat inadequate arsenic treatment for yaws, many cases were cured very quickly and then relapsed, the native population attributed the relapse to the fact that the disease had not run its natural course and produced immunity, and summed it up when the relapse occurred by the saying " him got juk [injection] before the yaws ripe " (L E Arnold—personal communication 1952)

I remember one day at Winneba on the Gold Coast when I had a line of yaws patients in front of me. They were to be injected with penicillin. One mother accompanying a child with beautiful florid yaws refused treatment for her son when she learned what the "pumpies" (injections) were for. The reason for this attitude, she explained, was the belief that if her son had the yaws cured before it had run its course, he would get "the worse disease" later on!

Turner [44] working in Jamaica, carried out a series of experiments on the resistance of yaws patients to re-inoculation with yaws treponemes. He found that out of 18 patients aged from 2 to 11 years, auto-inoculated with treponemes from their own lesions (duration of disease from onset, 1 week to 7 years) only one gave rise to a new lesion. From this he concluded that a resistance to auto-inoculation was set up early in the disease.

However, he inoculated 67 yaws patients with heterologous strains of *T. pertenue* and showed that immunity varied according to the duration of the first infection and that several years had to elapse before resistance to the second infection was attained (see table III).

TABLE III. RESULTS OF RE-INOCULATION OF YAWS PATIENTS WITH HETEROLOGOUS STRAINS OF YAWS TREPONEMES, ACCORDING TO DURATION OF FIRST INFECTION *

Duration of first infection (years)	Number of patients	Results of re-inoculation			
		positive		negative	
		number	%	number	%
< 1	16	12	75.0	4	25.0
1-3	14	10	71.5	4	28.5
3-8	18	8	44.4	10	55.6
10-65	19	3	15.8	16	84.2

* From Turner [44] (by permission of the editors of the *American Journal of Hygiene*)

Table IV gives Turner's results of re-inoculation with heterologous strains of yaws treponemes according to the stage of first infection. These results show that, in some cases, the resistance to heterologous infection is present when the active lesions are also present; there appears to be little immunity in the latent stage immediately following treatment. Immunity in the latent stage two years after the active lesions have disappeared as a result of either treatment or spontaneous regression, however, appears to be high.

It will be seen from what follows, however, that there is some epidemiological evidence that immunity may be present in the adult population without the medium of an active childhood infection.

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However, he inoculated 67 yaws patients with heterologous strains of *T pertenue* and showed that immunity varied according to the duration of the first infection and that several years had to elapse before resistance to the second infection was attained (see table III)

TABLE III RESULTS OF RE INOCULATION OF YAWS PATIENTS WITH HETEROLOGOUS STRAINS OF YAWS TREPONEMES, ACCORDING TO DURATION OF FIRST INFECTION *

Duration of first infection (years)	Number of patients	Results of re inoculation			
		positive		negative	
		number	%	number	%
< 1	16	12	75 0	4	25 0
1 3	14	10	7 5	4	28 5
3 8	18	8	44 4	0	55 6
10 65	19	3	15 8	16	84 2

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TABLE IV. RESULTS OF RE-INOCULATION OF YAWS PATIENTS WITH HETEROLOGOUS STRAINS OF YAWS TREPONEMES, ACCORDING TO STAGE OF FIRST INFECTION *

Stage of first infection at time of re inoculation	Number of patients	Results of re inoculation			
		positive		negative	
		number	%	number	%
Active lesions present	26	11	42 3	15	57 7
Latent owing to recent treatment active lesions within past year	23	19	82 6	4	17 4
Latent for more than 2 years owing to spontaneous regression or treatment	18	3	16 7	15	83 3

* From Turner[44] (by permission of the editors of the *American Journal of Hygiene*)

The number of people with a past or current history of yaws in a community in Jamaica is shown in table V From this table it can be seen that in the particular area studied (the Bath area), 58 3% of the total population had had yaws at some time or other It will be noted that the proportion of infected children rises rapidly with age to reach a peak in the 10-14 years' age-group, from this age group upwards, the incidence falls, until the 60 years and over group is reached when there is again a slight increase

TABLE V HISTORIES OF YAWS, PAST AND CURRENT, AMONG SUCCESSIVE AGE-GROUPS OF THE KNOWN POPULATION OF THE BATH AREA, JAMAICA, 1935 *

Age group (years)	Number of persons	History of yaws	
		number	%
Under 5	332	88	26 5
5 9	341	190	55 7
10 14	290	218	75 2
15 19	237	174	73 4
20 29	521	344	66 0
30 39	370	221	59 7
40 49	221	123	55 6
50 59	138	70	50 7
60 and over	118	68	57 6
Total	2 568	1 496	58 3

* From Turner & Saunders[46] (by permission of the editors of the *American Journal of Hygiene*)

Now, why should there be a fall in the rate of persons giving a history of the disease after the age of 10-15 years? There are several reasons which suggest themselves

(1) In the survey made, many cases with a positive Wassermann reaction but no history of yaws were not included As there was found to be little [illegible] ble that these cases were, in fact, yaws [illegible] those previously affected [illegible] This is unlikely, however, because yaws is never a killer' and the morbidity from yaws in patients over 40 years old is negligible

(3) It is possible that there had been a considerable interchange of population, this in fact did not take place, but if the interchange had been from areas with a lower incidence of yaws then, as will be seen later, the attack rate among non immune immigrants would have been expected to be higher

(4) It is possible that the memory of a childhood infection had faded with the advancing years Further, it is known that the serological and clinical evidence of the disease may disappear with the lapse of time

(5) It is possible but unlikely, that the incidence of yaws in the district at the time of the survey was greater than in former years

(6) It is possible that a natural immunity develops with advancing age

All these factors may play a part in reducing the incidence of yaws, either past or current, in the adult population

Now let us look at the problem from another angle, that of the annual total attack rates in successive age groups Table VI shows that the disease is mainly acquired in childhood and that persons are rarely attacked for the first time in adult life In the Bath area, the attack rate among all persons under 20 years of age is of the order of 50% whereas among those over 20 it is only about 2% [43]

Table VII shows the attack rates in the various age groups according to the estimated numbers of non immune persons, i e, those giving no history of previous infection An analysis of this table again shows the striking difference between the incidence of the disease in childhood and that in adult life The high numbers of non immune persons over 20 years old should also be noted It may be concluded from the study of attack rates that, owing either to a lack of natural immunity or to a greater liability to exposure, children who have never had an attack of yaws are more prone to infection than adults who have never had the disease

Granted that the number of estimated non immune persons in adult life may be artificially swollen by the factors mentioned before, namely, influx of non immune immigrants, poor memory, and fading physical and serological signs, it is obvious that the large numbers of non immune persons are due mainly to the constant maturation into the adult groups of uninfected, non immune children As these children grow older, they

TABLE VI ANNUAL ATTACK-RATE AMONG ALL PERSONS OF SUCCESSIVE AGE-GROUPS IN BATH AREA, JAMAICA, 1931 AND 1932 *

Age group (years)	Number of persons	1931		1932	
		number of new infections	attack rate (per 1 000)	number of new infections	attack rate (per 1,000)
Under 5	332	24	72	21	63
5 9	341	25	73	18	53
10 14	290	14	48	12	41
15 19	237	4	17	0	0
20 29	521	3	6	2	4
30 39	370	1	3	0	0
40 and over	477	0	0	0	0
Under 20	1 200	67	55.8	51	42.5
Over 20	1 368	4	2.9	2	1.4
Total	2 568	71	27.7	53	20.6

* From Turner & Saunders [43] (by permission of the editors of the *American Journal of Hygiene*)

TABLE VII ESTIMATED ANNUAL ATTACK-RATE AMONG NON IMMUNE PERSONS OF SUCCESSIVE AGE-GROUPS IN BATH AREA, JAMAICA, 1931 AND 1932 *

Age group (years)	Estimated number of non immune persons	1931		1932	
		number of new infections	attack rate (*per 1 000*)	number of new infections	attack rate (*per 1 000*)
Under 5	241	24	100	21	87
5 9	142	25	176	18	127
10 14	62	14	226	12	193
15 19	50	4	80	0	0
20 29	120	3	25	2	17
30 39	109	1	9	0	0
40 and over	161	0	0	0	0
Under 20	495	67	135	51	103
Over 20	390	4	10	2	5
Total	885	71	80	53	60

* From Turner & Saunders [43] (by permission of the editors of the *American Journal of Hygiene*)

appear to become less susceptible to infection, for table VII clearly shows that the tendency to acquire the disease in adult life is reduced

An example of the tendency to acquire the disease in childhood and of the rareness of attack for the first time in adult life is given by Powell,[27]

adult population was static and totally non-immune, yet the adult incidence of the disease was low

What then are the causes of a reduced attack rate among adults ? To my mind there are three possible explanations

(1) Many of the adult population may have had a childhood infection which they have forgotten and which now shows no signs physically or serologically It is possible that they still retain some immunity although their reagin tests are negative

(2) Persons in adult life may have acquired a natural immunity

(3) Because of advancing years, with less activity to produce trauma to the skin and the more staid conformity to an established social behaviour, more clothes are worn, and the exposure to and risks of infection are reduced

Cross-Immunity with Syphilis

There is a considerable amount of epidemiological evidence indicating *that syphilis is rare in regions where yaws is endemic, which suggests that* an attack of yaws confers immunity to syphilis, for example, syphilis does not exist among the Polynesians in Fiji, Tonga, and Samoa, whereas the incidence of yaws is high [29]

Hackett [8] described two areas in Uganda separated by 200 miles, in one, Lira, yaws was very prevalent (20 9% of outpatient department attendance, syphilis, 1 1%) with a high childhood incidence of papillomatous lesions and an absence of primary genital lesions in children and adults, in the other area Masaka, syphilis was prevalent (17 5% of outpatient department attendance, yaws, 1 6%) with a high incidence of primary genital lesions in young adults and an absence of generalized eruptions He was unable to differentiate tertiary skin lesions of yaws and syphilis clinically Findlay [7] states that yaws is uncommon in northern Nigeria but syphilis appears to take its place

As previously mentioned, Hewer [11] found yaws prevalent in southern Sudan and syphilis in northern Sudan with a gradual gradation of the two diseases between these areas He found a moderate pleocytosis in the cerebrospinal fluid of many cases of classical yaws in the south with no neurological signs, whereas in the north, frank meningovascular syphilis was encountered Hewer attributed this mainly to a difference in race although climatic factors could not be excluded

In Seaforth, 93% of the patients with infectious lesions were under 20, whereas the incidence of infectious cases was 6 5% of all persons under 20 and 0 3% of those over 20

TABLE VIII AGE DISTRIBUTION OF CASES EXHIBITING INFECTIOUS YAWS LESIONS AMONG THE TOTAL KNOWN POPULATION OF THE BATH AND SEAFORTH AREAS, JAMAICA *

Age group (years)	Bath area			Seaforth area		
						proportion of cases to total persons (%)
Under 5	332	61	18 4	218	13	6 0
5 9	341	75	22 0	241	23	9 5
10 14	290	46	15 9	194	9	4 6
15 19	237	12	5 1	165	8	4 8
20 29	521	14	2 7	391	3	0 8
[illegible] 39	370	0	0	301	0	0
[illegible]	221	2	0 9	200	0	0
[illegible]	138	1	0 7	124	1	0 8
[illegible] and over	113	1	0 8	133	0	0
Total	2 563	212	8 3	1 967	57	2 9

* From Turner & Saunders[44] (by permission of the editors of the *American Journal of* [illegible]

[illegible]'s clear then that the sources of contagion are largely confined to [illegible] in the first two decades of life Persons under 20 normally comprise [illegible] 50% of the Jamaican population and therefore treatment may be [illegible]led, for the number infected in this age group is less than one-fifth [illegible] total under 20 years old

[illegible]om table IX we can see that the attack-rate in the total population [illegible]en reduced by treatment from 56 7 per 1,000 to 7 3 and 8 2 per 1,000 [illegible] the first and second year respectively, and the attack-rate in the non-[illegible]ine population from 119 5 per 1,000 to 15 4 per 1,000 in the first year [illegible] 17 3 per 1,000 in the second There appears, however, to be a constant [illegible] below which we cannot go with the ordinary treatment methods If [illegible] figures of the Jamaica Yaws Commission[33] are analysed, it is seen [illegible]hat relapses after arsenic or bismuth treatment are about 14%-15% one [illegible]ear after treatment and 25% 2 years after (see table X)

This continuation of infectivity within the community may be due to several causes The most obvious one is relapse in treated cases It is unfortunate that the figures given by the Jamaica Yaws Commission do not give the age groups for the relapsing cases or the site of the relapsing lesions

SUMMARY

After briefly reviewing the geographical distribution of yaws, the author considers the relation of temperature altitude, rainfall, geological formation, and humidity to the incidence of the disease Yaws flourishes in hot climates near the mean annual isotherm of 80°F, where there is comparatively little fluctuation of temperature and where there is an annual rainfall of over 50 inches The number of cases in such areas tends to increase during the rainy seasons, and there may be differences in the type and location of the lesions in different seasons However a high rainfall does not necessarily entail a high incidence of yaws

Investigations in Jamaica seem to show that the incidence of yaws is higher where the soil is impervious and the drainage poor although other areas with pervious soil may have a higher rainfall The author considers that all these factors can be merged into the general one of humidity, high humidity being associated with a high incidence of yaws

The disease is primarily one attacking rural communities, particularly those in poor economic circumstances and with low standards of hygiene, the incidence declining with a rise in social and economic status There is no conclusive evidence that either dietary deficiency or racial characteristics have any direct effect on incidence, but it appears that rather more males than females suffer from the disease, which is most usually acquired during the first ten years of life The commonest site of the initial lesion is the lower leg which corresponds to the site of the greatest frequency of traumata in rural areas It is generally considered that the most frequent mode of infection is by person-to-person contact, the causative agent—*Treponema pertenue*—being deposited on the skin of a non immune person

RÉSUMÉ

Après avoir exposé rapidement la répar tition géographique du pian, l'auteur étudie l'influence que peuvent exercer sur la fréquence de la maladie la température l'altitude, les précipitations, la nature du sol et du sous sol et l'humidité Le pian est particulièrement repandu dans les régions chaudes proches de l'isotherme annuel moyen de 27°C, où les fluctuations de température sont relativement faibles et où la hauteur pluviométrique annuelle est superieure a 1 270 mm On assiste, dans ces regions, à une recrudescence de la maladie aux époques pluvieuses de l'année d'autre part, la nature et la localisation des lésions peuvent varier avec les saiso[illegible] Toutefois, les pluies abondantes ne s'[illegible] compagnent pas nécessairement d'[illegible] fréquence elevée du pian

Des enquetes entreprises à la Jamaï[illegible] semblent indiquer que cette affection [illegible] plus fréquente dans les régions où le [illegible] est imperméable et l'ecoulement des ea[illegible] imparfait que dans celles où les chutes [illegible] pluie sont plus considérables, mais où [illegible] sol est perméable L'auteur ramène t[illegible] les facteurs considérés à la notion génér[illegible] d humidité, une forte humidite correspo[illegible] dant à une fréquence élevée du pian

La maladie frappe surtout les collecti[illegible] tes rurales, notamment celles qui so[illegible] pauvres et ou l'hygiène laisse à désirer [illegible] fréquence diminue lorsque les conditio[illegible] sociales et économiques s'améliorent [illegible] ne peut affirmer que la race ou le régi[illegible] alimentaire ait une incidence directe sur [illegible] fréquence du pian, mais il semble que ce[illegible] maladie, qui se contracte généralement [illegible] cours des dix premières années de vie, so[illegible] un peu plus répandue chez les hommes q[illegible] chez les femmes. Les lésions initiales app[illegible] raissent le plus souvent sur la partie inf[illegible] rieure de la jambe, qui est la région du cor[illegible] la plus exposée aux blessures dans les zon[illegible] rurales On estime communément que [illegible] pian se transmet dans la plupart des c[illegible] par contacts d'homme à homme · *Trep[illegible] nema pertenue*, l'agent causal, est dépo[illegible] sur la peau d'un sujet non immun et pénét[illegible]

and entering through cuts or abrasions It is also possible that yaws may be transmitted by insect vectors *in Jamaica* for instance there is a striking degree of correlation between the distribution of the fly *Hippelates pallipes* and that of yaws However it is still uncertain whether the one affects the other or whether both are affected by the same environmental factors which cause their distribution to coincide Children born to mothers infected with yaws are generally unaffected and most of the evidence seems to indicate that the disease is not acquired congenitally

dans l organisme par les coupures ou les excoriations Il se peut aussi que le pian *soit transmis par des insectes vecteurs* La distribution geographique de la mouche

ou si leur coexistence s expl que simplement par le fait que les mêmes conditions régissent leur répartition Les enfants de mères pianiques naissent généralement indemnes, aussi y a t il lieu de croire que le pian n est pas héréditaire

The author next considers the question of natural and acquired immunity and points out that many native populations believe that a childhood infection of yaws prevents or mitigates infection in adult life Experiments made in Jamaica indicate that persons auto-inoculated with treponemes from their own lesions are unlikely to develop new lesions and that resistance to auto-inoculation is set up early in the course of the disease However inoculations with heterologous strains of *T pertenue* show that several years must elapse before resistance to a second infec tion is attained There is also some epidemiological evidence that immunity may exist in adults without their having had an active infection in childhood Tables giving attack rates in Jamaica by age groups show a striking d fference between the incidence of yaws in childhood and that in later years The author sug gests three poss ble explanations for this (1) many adults may have had and forgot ten a childhood infection and may retain some immunity although their reagin tests *are negative* (2) *they may* have acquired a natural immunity and (3) they are generally less active and wear more clothes than children thus reducing the risk of infection

L auteur examine ensuite la question de l immunité naturelle et de l immunité acquise Dans de nombreuses régions la population croit communément que le pian contracté dans l enfance prévient ou atté nue l infection à l âge adulte Des expé riences faites à la Jamaïque indiquent que les personnes inoculees avec des trépo nèmes provenant de leurs propres lesions acquièrent rarement de nouvelles lesions et que la résistance à l auto-inoculation s ins talle à un stade précoce de la maladie Toutefois des inoculations pratiquées avec des souches hétérologues de *T pertenue* montrent qu il faut plusieurs années avant que s établ sse une résistance aux reinfec tions D autre part, certaines donnees épi démiologiques donnent à penser que les adultes peuvent posséder une immunite sans avoir éte atteints de pian évolutif dans leur enfance En effet les tableaux indi quant les taux d infection par groupes d age à la Jamaïque font apparaître une diffé rence frappante entre la frequence du pian chez les enfants et chez les adultes L auteur voit à cela trois explications possibles *1) de nombreux adultes peuvent sans se* rappeler avoir eu une infection dans leur enfance et avo r conserve une certaine immunite bien que les épreuves sérolo giques soient négatives 2) ils peuvent avoir acquis une immunité naturelle 3) étant généralement mo ns act fs et plus vêtus que les enfants ils sont moins exposés au risque d infection

There is also evidence that syphilis is rare in regions where yaws is endemic —a fact which suggests that there is some cross immunity between the two d seases This cross immunity is most marked in

D autre part la syphilis est rare dans les régions où le pian sévit à l état endem que fait qui suggère l existence d une certaine immunite croisée entre les deux malad es Cette immunite croisee est particulièrement

syphilis and in those cases of yaws where the active period or the latency is of long duration This is due to the fact that the processes activating the immunizing mechanism develop much faster in syphilis than in yaws

Tables are also given showing the age-distribution of infectious yaws lesions in two areas in Jamaica, the reductions in attack-rates after treatment, and the percentages and types of relapses after treatment with neoarsphenamine and bismuth salicylate These show that relapses after such treatment are about 14 % after one year and 25 % after two years, and that treated infectious cases give a higher percentage of infectious relapses than treated latent or non infectious cases

Since the child population is more susceptible to yaws than the adult and *since there is little immunity to a second* infection immediately after treatment of the disease in its early stage, the author feels that an immunological approach is worth considering He is working on an active and passive method of immunization, gamma globulin from the blood of adults who have had yaws being injected into actively diseased children This globulin will be given as a first injection in order to stimulate immunity, some time later the patient will be cured with penicillin It is hoped that such treatment may produce a cross-immunity to syphilis and prevent reinfection or relapse

Finally, the author gives two objectives to be observed in eliminating yaws

(1) adequate treatment, not merely to render cases non infectious but rather to cure cases completely and thus avoid relapses, and

(2) follow up and consolidation of mass-treatment programmes to treat any relapsing cases

nette dans la syphilis et dans les formes de pian dont la phase évolutive ou la phase de latence est de longue duree La raiso est que le processus d'immunisation e beaucoup plus rapide dans le cas de l syphilis que dans celui du pian

L'étude s'accompagne de tableaux ind quant par groupes d'âge la fréquence de lésions pianiques contagieuses dans deu régions de la Jamaïque, la diminution d fréquence des attaques après traitement, les pourcentages et la nature des rechute après traitement par la néoarsphénamine le salicylate de bismuth Ces chiffres mon trent d'une part que la fréquence de rechutes après ce traitement est d'enviro 14 % après un an et d'environ 25 % apr deux ans Il font également ressortir que l pourcentage des rechutes de pian cont gieux est plus éleve chez les malades trait qui avaient été atteints de pian contagieu que chez ceux qui avaient souffert de pia latent ou non contagieux

Comme les enfants sont plus sujets a pian que les adultes et que le traitement d *la maladie à sa phase precoce n'est suiv* dans l'immédiat, que d'une faible immu nite, il serait utile d'envisager le problem du point de vue immunologique L'auteu s'efforce de mettre au point une method d'immunisation active et passive qui cor siste à injecter à des enfants souffrant d pian à la phase évolutive de la gamm *globuline prélevée dans le sang* d'adulte ayant contracté la maladie antérieurement L'auteur commence par une injection d globuline afin de susciter l'immunite e quelque temps après, administre de l pénicilline Il espère que ce traitement ser susceptible d engendrer une immunité croi sée à l'egard de la syphilis et de préven les réinfections ou les rechutes

L'auteur souligne enfin qu'il y a deu principes essentiels à observer dans la lutt contre le pian :

1) il faut appliquer un traitement qui n vise pas simplement à blanchir les malades mais qui assure une guérison complète e évite les rechutes,

2) il faut exercer une surveillance post *thérapeutique et consolider les résultat* des programmes de traitement de mass en soignant toutes les rechutes

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DISCUSSION: PART I

Chairman Dr M SOETOPO
Rapporteur Dr C R REIN

In a paper entitled " Unknowns in yaws ", read on behalf of its author, Dr C. M Hasselmann, the opinion was expressed that syphilis and yaws were distinct clinical entities This gave rise to considerable discussion on the points of similarity and the points of difference between the two diseases It was recognized that there were differences in the clinical manifestations and in the evolution of the two diseases It was also pointed out that some of the important points of similarity were the identical morphology of the treponemes, the common antigenic response of the host, and the similar prompt response to effective therapy

The clinical and laboratory evidence for and against cross immunity between syphilis and yaws was also discussed It had long been believed that infection with yaws conferred immunity against syphilis Recent studies suggest that this cross immunity may not be of as high an order as has previously been believed

A note on the relationship between yaws and malnutrition was submitted by Dr H A P C Oomen, who observed that in malnourished persons there was a less extensive evolution of the early lesions but a tendency to develop more destructive late lesions The disease might add to an already defective nutritional state by the loss of appreciable quantities of serum protein through open lesions It was also pointed out that there was a frequent association of yaws with hookworm infestation and that these two diseases had a distinctly unfavourable effect on the patient's nutritional status

Trauma was considered to be one of the factors in determining the site of development of yaws lesions Several workers had noted that wherever there was a high incidence of early lesions there also was a high incidence of gummata, and the opinion was also expressed that there was some epidemiological evidence that gummatous lesions might develop as a result of superinfection

Certain problems relating to the employment of serological tests in yaws areas were discussed The prevalence of other diseases (e g , leprosy and malaria) known to cause false positive reactions was noted Several participants noted that seronegativity appeared to be more frequent in active yaws cases than had previously been believed, and there was evidence that zone reactions occurred frequently in the tropics, primarily because

of difficulties in maintaining the antigens suitably It was suggested that serological antigen should be supplied in small (0 5 ml) ampoules to avoid evaporation and subsequent crystallization of the cholesterol

The possible role of insect vectors in the spread of yaws was also discussed, and the participants considered a report by Commander R E Rock who, on Guam, had noted apparently improved results in yaws control when mass treatment was combined with widespread use of insecticides It was considered probable that insects might play a role in spreading yaws, but that there was little incontrovertible proof of this Spread of the disease occurred primarily through direct body contact with infected persons The need for further research on this question was indicated

DISCUSSION : PARTIE I

President Dr M SOETOPO
Rapporteur Dr C R REIN

Dans une communication sur les inconnues du probleme du pian, due au Dr C M Hasselmann, l idee a ete exprimee que la syphilis et le pian etaient des entites cliniques distinctes Cette declaration a donne lieu a une discussion nourrie sur les ressemblances et les dissemblances entre les deux maladies Il fut admis qu il y avait entre les deux affections des differences dans les caractères cliniques et l'evolution On mentionna d'autre part au nombre des similitudes les plus importantes la morphologie identique des treponèmes, la reaction serologique de l hôte, commune aux deux affections, et la reponse rapide au traitement

Les observations positives ou négatives faites par la clinique et le laboratoire sur l immunite croisee syphilis pian furent egalement discutees On a cru longtemps que le pian conferait l immunite contre la syphilis Des etudes recentes permettent de penser que l'immunité croisee n'est pas aussi complète qu on l avait cru

D apres une note du Dr H A P C Oomen sur la relation entre le pian et la malnutrition, les lesions primaires seraient moins etendues chez les personnes souffrant de malnutrition mais les lesions tardives seraient au contraire plus destructrices Le pian peut aggraver un etat de malnutrition par la perte appreciable de proteines seriques qui se produit par les lesions ouvertes On fit remarquer, d'autre part, que le pian est souvent associe à l'ankylostomiase et que les deux affections ont de facheuses repercussions sur l'etat nutritionnel des malades

Il fut admis que les traumatismes determinaient les localisations de l'infection pianique, selon plusieurs chercheurs une forte incidence de gommes accompagne souvent une forte incidence de lesions primaires

L'idee a éte emise, d'apres certaines observations, que les lesions gommeuses resulteraient d'une surinfection

Certains problèmes relatifs à l'emploi de tests serologiques dans les regions pianiques ont été discutes L'existence d'autres maladies telles que la lèpre et le paludisme, connues pour provoquer de fausses réactions positives, a aussi éte notee Quelques participants ont fait remarquer que la séronegativité est plus fréquente dans les cas de pian actif qu'on ne l'avait cru jusqu'alors, il semble d'autre part que les phenomenes de zones sont frequents dans les tropiques, où il est difficile de conserver les antigènes dans de bonnes conditions Il a été proposé que l'antigene destine aux réactions serologiques soit livre en petites ampoules (0,5 ml), afin d'eviter l'évaporation et la cristallisation subséquente du cholesterol

Le rôle éventuel d'insectes vecteurs dans la dissémination du pian a aussi éte envisagee, les participants prirent connaissance du rapport du Commander R E Rock qui, à Guam, observa des resultats apparemment meilleurs lorsque, tout en appliquant le traitement systématique, on faisait un large usage des insecticides On a estimé que le role des insectes dans la transmission du pian etait probable mais non prouve La maladie se répand surtout par contact direct avec les personnes infectées Des recherches plus poussees, sur ce sujet, sont nécessaires

Part II

ANTIBIOTICS IN THE TREATMENT OF YAWS

Partie II

LES ANTIBIOTIQUES DANS LE TRAITEMENT DU PIAN

THE TREATMENT OF INFECTIOUS YAWS WITH ONE INJECTION OF PENICILLIN *

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This report deals with the clinical and serological response of infectious yaws to one intramuscular injection of 2 ml (600,000 units) of procaine penicillin G in oil with 2% aluminium monostearate (PAM), as observed during the mass yaws-eradication campaign in Haiti, which was launched in July 1950 by the Yaws Eradication Service under the Ministry of Health and with the technical and financial assistance of WHO and UNICEF

It may be appropriate to discuss at the outset the rationale for the dose of penicillin used It has been apparent from the beginning of organized investigations of yaws that the disease responds in essentially the same way as syphilis to treponemicidal therapy It has been noted, however, that the serological response to treatment seems to be slower than that of syphilis When it is remembered that the clinical course of the two diseases is different and that a patient with open lesions of yaws may have had the disease for several years in contrast to months in the case of a patient with early infectious syphilis, the slower serological response of yaws would be expected It has furthermore been noted that there seems to be no correlation between serological response and sustained clinical cure

After penicillin therapy had been discovered for syphilis, it was soon utilized for yaws as well, and early evidence suggested that the dose required for cure was of the same order of magnitude as for syphilis Studies indicated that it was possible to cure a high proportion of early cases of syphilis when a serum concentration was maintained for about 72 hours with

* From the Yaws Erad cation Service of the Government of Haiti a Spanish version of th s article appears in *Bol Ofic sanit pan-amer* 1952 33, 565

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aqueous penicillin When PAM became available, it was possible, in the majority of cases, to maintain a blood-level for that length of time with a single injection of 300,000 units Furthermore, with this single injection of 300,000 units of PAM, a significant rate of cure was attained even in secondary syphilis Preliminary studies in man, and experimental evidence available from rabbit studies, suggested, as would be expected, that the rate of cure could be increased by the use of 600,000 units In view of this evidence it was decided to utilize the larger dose for the mass treatment of yaws in Haiti

Although relapses and failures could be expected to occur with this schedule, the following considerations entered into the making of the final decision

(1) For the control of a disease it is unnecessary to cure every open lesion case in order to bring transmission to a halt While the exact critical level is not known for yaws, there is evidence to suggest that, with treatment which heals a large number of open lesions, transmission is diminished so that the disease will not re-establish itself to the same extent

(2) In view of that evidence, it is realized that success can be achieved even without cure of every individual case Thus the use of smaller doses of penicillin, known to have appreciable failure-rates in syphilis, could be considered For, on the basis of experience in syphilis, it is becoming evident that, in order to achieve a cure-rate of approximately 95% by a single course of therapy, it is necessary to give a dose of the order of 4,800,000 units Whether this is given in several injections or in one theoretically makes no difference to the effectiveness If the same reasoning is applied to yaws, it is evident that the cost of a mass-treatment programme requiring eight times as much penicillin as one utilizing the smaller dose of 600,000 units would be not inconsiderable

Site of Activities

In order to evaluate the effectiveness of penicillin in the treatment of yaws, it was necessary to select a small population and geographical area where more careful medical and serological supervision could be practised than was possible in the mass campaign as a whole Several considerations led to the choice of Bainet as the study site

(1) It is in a mountainous region with an adequate supply of water, furthermore, it is cut off from free intercourse with other island inhabitants by rather difficult terrain

(2) The region is accessible from Port-au-Prince

(3) There were no facilities near at hand for the continuous treatment of yaws where other treatment might have been given, thereby perhaps interfering with the research programme

(4) Owing to the high prevalence of the disease, the inhabitants were most anxious to have a treatment programme carried out and surveillance continued

The area has a population of about 40 000, but our activities were concentrated close to the city where the market which is open twice weekly, draws people from the entire surrounding territory

Methods

Realizing that, in view of the living conditions, it would be necessary in Haiti to treat not only yaws but also any other conditions which might present themselves, in order to secure the co operation of the villagers in the follow-up study, a general medical clinic staffed by a full time physician and providing free medical care was established by the Government of Haiti The special yaws clinic was open on Wednesdays and Saturdays to coincide with the market days

On 17 February 1951, the yaws clinic was opened and the patients assembled Word had been passed throughout the island that treatment would be given on the market days At the first clinic sessions, up to 800 patients per day were seen Case histories of yaws were noted and physical examinations carried out by the physician Since recorded ages meant little, as few individuals knew their age, it was necessary for the examining physician to estimate the proper age Darkfield examinations were carried out for all lesions, but, in the case of "wet crab", a patient was not infrequently put under treatment in the absence of a positive darkfield test, since the location and the type of lesion made it difficult to establish the presence of the infective organism

Blood was drawn for serological testing, and, as a matter of routine all samples were subjected to the quantitative Kahn standard and VDRL (Venereal Disease Research Laboratory, Chamblee, Ga, USA) slide flocculation tests All tests were performed at the Institute of Serology at Port-au Prince under carefully controlled conditions

Treatment in each case consisted of a single injection of 600,000 units of PAM, except for a small group which received 300,000 units At Bainet we treated with 300 000 units of PAM all members of the family in which a lesion was found, for it was felt that, if all family members were treated the likelihood of reinfection from contact with a member of the household, who was in the incubation stage at the time of treatment of the original lesion, would be minimized Thus any treated individual developing fresh lesions could be considered as having a relapse

Follow up was considered essential and every effort was expended to secure continuing observation Monthly observations were desired, but it was necessary to compromise and to accept less frequent observations Follow up was facilitated by inspectors' calling at the homes to remind the

patients to return to the clinic Three inspectors were assigned the responsibility of bringing the patients in the area to the clinic In some cases it was necessary for the physician to go to the home in order to secure continuity of observation This programme was facilitated by the presence of the free clinic, which served to attract the individual for other reasons, and by the reward of a small bar of soap at the completion of each post treatment visit with the promise of another if the patient returned In view of the scarcity and cost of soap in the country and the desire of the inhabitants to cleanse themselves and their clothing better, the value of such an inexpensive attraction to follow up visiting is obvious

We are sure that our problem in identification of the patient is no different from that experienced by others, for names are not fixed and the patient frequently changes his appellation In order to keep the records straight, each patient was given at his first visit to the clinic, a card which he was to present at each subsequent visit Patients suffering from infectious yaws were given red cards bearing their name and clinic serial number non infectious cases were given green cards, and cases other than yaws were given white cards Each card bore the necessary identification data. Constant checking of the patients was necessary, for individuals occasionally lost cards or frequently exchanged them with friends so as to gain possession of a red card for a subsequent clinic visit it was only the red-card holders who were given soap on repeat visits It is our feeling however that, in spite of these factors, it has been possible to be sure of the identification so that the follow up observations are properly matched, for the follow up workers and the local officials were most helpful

Results of Treatment

Results of treatment are based on 636 patients who were treated between 17 February and 27 October 1951 Since the last examination included in the analysis was performed on 3 January 1952, the maximum possible period of observation ranges from 69 to 321 days

Those treated between 17 February and 16 June 1951 received 2 ml of a preparation which, it was subsequently found, failed to maintain a satisfactory blood level, despite the claims of the manufacturer Apparently there had been a defect in its manufacture In the following discussion, these patients, numbering 358, are classified as having received "unsatisfactory" penicillin

Patients treated after 16 June received a preparation known to give satisfactory levels This preparation, referred to as "satisfactory" penicillin was administered in injections of 2 ml from June to August 1951 This second series included 221 patients

Those treated during September and October received one half the original dosage—1 ml (300,000 units) This was a small group of 57 patients

Since it was felt that a high rate of failure might be expected to follow the use of the unsatisfactory penicillin and possibly of the 1 ml of satisfactory penicillin, these three series of patients have been analysed separately

TABLE I AGE DISTRIBUTION OF PATIENTS BY STAGE OF YAWS AND BY AMOUNT BY PENICILLIN

Age-group (years)	Primary yaws		Secondary yaws		Wet crab		Total	
	number	%	number	%	number	%	number	%
			"unsatisfactory" penicillin — 2 ml					
10 or under	13	86 6	110	50 7	28	22 2	151	42 2
10 20	1	6 7	67	30 9	69	54 8	137	38 3
Over 20	1	6 7	40	18 4	29	23 0	70	19 5
Total	15	100 0	217	100 0	126	100 0	359	100 0
			"satisfactory" penicillin — 2 ml					
10 or under	12	70 6	27	35 5	16	12 5	55	24 9
10 20	5	29 4	24	31 6	70	54 7	99	44 8
Over 20	—	—	25	[illegible]	[illegible]	32 8	67	30 3
Total	17	100 0	76	100 0	128	100 0	221	100 0
			"satisfactory" penicillin — 1 ml					
10 or under	2	66 7	6	24 0	1	3 4	9	15 8
10 [illegible]	1	33 3	9	36 0	16	55 2	26	45 6
Over [illegible]		—	10	40 0	12	41 4	22	38 6
Tota	3	100 0	[illegible]	100 0	29	100 0	57	100 0
			total					
10 or under	27	77 1	143	45 0	45	15 9	215	33 8
10 20	7	20 0	100	31 4	155	54 8	262	41 2
Ove 20	1	2 9	75	23 6	83	29 3	[illegible]	25 0
Total	35	100 0	318	100 0	283	100 0	636	100 0

The age d[illegible]

25% were over 20 years old In the three treatment groups, however, the percentage of children 10 years old or under ranged from 42 in the unsatisfactory penicillin group to 16 in those treated with 1 ml of satisfactory penicillin, and the percentage who were 20 years old or over ranged from 20 in the first series to 39 in the third series

TABLE II. AGE DISTRIBUTION BY SEX AND BY STAGE OF YAWS OF PATIENTS TREATED WITH 2 ml (600,000 UNITS) OF "UNSATISFACTORY" PENICILLIN *

Age group (years)	Primary yaws			Secondary yaws			'Wet crab'			Total		
	male	female	total	male	female	total	male	female	total	male	female	total
						number						
0-5	—	4	4	27	10	37	1	—	1	28	14	42
6-10	2	7	9	51	22	73	19	8	27	72	37	109
11-15	—	—	—	34	15	49	31	17	48	65	32	97
16-20	—	1	1	9	9	18	18	3	21	27	13	40
21-30	—	—	—	11	11	22	11	3	14	22	14	36
31-40	—	1	1	4	6	10	6	8	14	10	15	25
41-50	—	—	—	1	4	5	—	—	—	1	4	5
Over 50	—	—	—	1	2	3	1	—	1	2	2	4
Total	2	13	15	139	79	217	87	39	126	227	131	358
						percentage						
0-5	—	30.8	26.6	19.6	12.7	17.1	1.2	—	0.8	12.3	10.7	11.7
6-10	100.0	53.8	60.0	37.0	27.8	33.6	21.8	20.5	21.4	31.7	28.2	30.4
11-15	—	—	—	24.6	19.0	22.6	35.6	43.6	38.1	28.6	24.4	27.1
16-20	—	7.7	6.7	6.5	11.4	8.3	20.7	7.7	16.7	11.9	9.9	11.2
21-30	—	—	—	8.0	13.9	10.1	12.6	7.7	11.1	9.7	10.7	10.1
31-40	—	7.7	6.7	2.9	7.6	4.6	6.9	20.5	11.1	4.4	11.5	7.0
41-50	—	—	—	0.7	5.1	2.3	—	—	—	0.5	3.1	1.4
Over 50	—	—	—	0.7	2.5	1.4	1.2	—	0.8	0.9	1.5	1.1
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

TABLE III AGE DISTRIBUTION BY SEX AND BY STAGE OF YAWS OF PATIENTS TREATED WITH 2 ml (600 000 UNITS) OF SATISFACTORY PENICILLIN *

Age g oup (yea s)	Pr mary yaws			Secondary yaws			Wet c ab			Total		
	male	female	ota	ma e	fema e	to al	male	fema e	to al	ma e	female	tota
						number						
0 5	3	2	5	5	3	8	1	1	2	9	6	15
6 0	3	4	7	11	8	19	11	3	14	ⁿ5	15	40
11 5	3	2	5	6	6	22	37	18	55	56	26	82
16 20		—		1	1	2	10	5	15	1	6	17
2 30	—	—	—	7	6	13	14	11	25	2	17	38
3 -40	—		—	4	4	8	8	4	12	12	8	20
4 50		—	—	3	—	3	3	—	3	6	—	6
O e 50	—	—		—	1	1	1	1	2	1	2	3
To a	9	8	17	47	29	76	85	43	128	141	80	221
						percentage						
0 5	33 3	2ⁿ 0	ⁿ9 4	10 6	10 4	0 5	1 2	2 3	1 6	6 4	7 5	6 8
6 0	33 3	50 0	41 2	23 4	ⁿ7 6	25 0	12 9	7 0	0 9	17 7	18 7	18 1
11 5	33 3	5 0	29 4	34 1	ⁿ0 7	ⁿ9 0	43 5	41 9	43 0	39 7	32 5	37 1
16 20			—	2 1	3 4	2 6	1 8	11 6	11 7	7 8	7 5	7 7
2 30	—	—	—	14 9	ⁿ0 7	17 1	16 5	25 6	19 5	14 9	2 3	17 2
3 40	—	—		8 5	13 8	10 5	9 4	9 3	9 4	8 5	10 0	9 0
41 50	—	—	—	6 4	—	4 0	3 5	—	2 3	4 3	—	2 7
Ove 50	—	—		—	3 4	3	1 2	2 3	1 6	0 7	2 5	1 4
Total	00 0	100 0	100 0	100 0	00 0	00 0	100 0	100 0	00 0	100 0	00 0	00 0

* Treated from 9 June to 29 August 1951 max mum obse vation per od 128-209 days

Furthermore, this difference in age distribution carried through the three stages of yaws In other words a greater percentage of younger patients were treated in the first series than in the last regardless of the stage of disease

TABLE V SEX DISTRIBUTION OF PATIENTS BY STAGE OF YAWS AND BY AMOUNT OF PENICILLIN

Sex	P ma y yaws		Secondary yaws		Wet c ab		Tota	
	numbe	%	number	%	number	%	numbe	%
				unsatisfactory penic ll n — 2 ml				
Male	2	13 3	138	63 6	87	69 0	[illegible]27	63 4
Female	13	86 7	79	36 4	39	31 0	1[illegible]1	36 6
Tota	5	100 0	217	100 0	126	100 0	358	100 0
				satisfactory penicillin — 2 ml				
Ma e	*9*	*5[illegible]9*	*47*	*6 8*	*85*	*66 4*	*141*	63 8
Fema e	8	47 1	[illegible]9	38 2	43	33 6	80	36 2
Total	17	100 0	76	100 0	1 8	100 0	[illegible]21	100 0
				sat sfactory pen cilln — 1 ml				
Male	2	66 7	21	84 0	24	82 8	47	8[illegible]5
Female	1	33 3	4	16 0	5	17 2	0	17 5
Total	3	00 0	25	100 0	[illegible]9	100 0	57	100 0
				total				
Ma e	3	37	206	64 8	196	69 3	4 5	65 3
Fema e	[illegible]	*62 9*	*112*	*35 2*	*87*	*30 7*	*221*	34 7
Tota	35	00 0	318	100 0	283	100 0	636	100 0

Two thirds of the patients in the analysis were males As shown in table V this distribution was fairly constant in the secondary and wet crab stages in the first two series In the group given 1 ml of penicillin the percentage of males was higher 82 5

Although both the quantitative Kahn and VDRL tests were performed on all blood specimens this analysis is based on results of the Kahn test alone since this procedure is more widely used and has been reported more frequently in previous papers on yaws In tables VI VII and VIII the results of treatment are shown as

(1) *negative—return to negativity*

(2) significant drop in titre—a drop of at least 2 tubes in serial dilution quantitative tests

(3) no significant change in titre—no change in titre or a change of less than 2 tubes,

(4) relapse or reinfection—serological relapse or subsequent development of lesions

Results attained with 2 ml of unsatisfactory penicillin are shown, in table VI by stage of yaws and by period of observation It should be pointed out that patients are included in a period only if they were actually examined in that period This explains the larger totals in the later observation periods Although this method is not as satisfactory as the statistical method which has been utilized for the evaluation of penicillin treatment in syphilis, it is believed that it presents a fairly accurate picture of the results which have been observed to date Of the 358 patients treated with 2 ml of unsatisfactory penicillin, 245 were observed for six months or more following treatment (181 340 days) Of these, 78 (31 8%) had reverted to negative and an additional 148 patients (60 4%) had a significant drop in titre Among the 358 patients, only 4 experienced a relapse or reinfection (see Annex 1) [5] These represented 1 1% of the patients observed over a period of from three to six months and 0 8% of the patients observed for more than six months—or a total relapse- or reinfection rate of less than 2% Although best results were obtained in the early stages, all four failures were observed in the secondary stage Two were serological failures and two were clinical failures in which the possibility of reinfection could not be ruled out

Table VII gives a similar analysis for patients treated with 2 ml of satisfactory penicillin Since these patients were treated from June to August, few had an opportunity to be observed for more than six months At three to six months, 13 4% were negative and 62 2% had experienced a significant drop in titre So far no relapses or reinfections have been observed in this series

Results attained with 1 ml of satisfactory penicillin are shown in table VIII This is a small group and only 28 patients have been observed for from three to six months However, 21 4% were negative and 57 2% showed a significant drop in titre

These results are summarized in table IX, which shows the percentage with a satisfactory course following the three schedules of therapy

In the secondary stage at three to six months after treatment, 86 1% treated with unsatisfactory penicillin and 77 3% treated with 2 ml of satisfactory penicillin showed satisfactory results In the " wet crab " stage, the percentages were 74 0 and 73 1 The slight difference observed is in favour of the unsatisfactory penicillin Either the unsatisfactory penicillin was better than expected, or the results reflect the younger ages of the patients treated by this schedule

[5] Since this paper was prepared ten additional patients in this group have been reported as clinical failures Eight are considered to be definite relapses and the other two to be cases of possible reinfection —ED

TABLE VI. RESULTS OF THERAPY BY STAGE OF YAWS ON PATIENTS TREATED WITH 2 ml (600,000) UNITS OF "UNSATISFACTORY" PENICILLIN *

Observation period (days)	Negative		Significant drop in titre		No significant change in titre		Relapse or reinfection		Total	
	number	%	number	%	number	%	number	%	number	%
primary yaws										
31-60	3	100.0	—	—	—	—	—	—	3	100.0
61-90	2	50.0	2	50.0	—	—	—	—	4	100.0
91-180	3	42.9	3	42.9	1	14.2	—	—	7	100.0
181-340	7	77.8	2	22.2	—	—	—	—	9	100.0
secondary yaws										
31-60	3	4.5	44	66.7	19	28.8	—	—	66	100.0
61-90	3	4.8	43	68.2	17	27.0	—	—	63	100.0
91-180	20	18.5	73	67.6	13	12.0	2	1.9	108	100.0
181-340	62	41.3	76	50.7	10	6.7	2	1.3	150	100.0
"wet crab"										
31-60	—	—	20	44.4	25	55.6	—	—	45	100.0
61-90	—	—	23	59.0	16	41.0	—	—	39	100.0
91-180	2	2.8	52	71.2	19	26.0	—	—	73	100.0
181-340	9	10.5	70	81.4	7	8.1	—	—	86	100.0
total										
31-60	6	5.3	64	56.1	44	38.6	—	—	114	100.0
61-90	5	4.7	68	64.2	33	31.1	—	—	106	100.0
91-180	25	13.3	128	68.1	33	17.5	2	1.1	188	100.0
181-340	78	31.8	148	60.4	17	7.0	2	0.8	245	100.0

* Treated from 17 February to 16 June 1951 maximum observation period [illegible] days

TABLE VII. RESULTS OF THERAPY BY STAGE OF YAWS ON PATIENTS TREATED WITH 2 ml (600,000 UNITS) OF "SATISFACTORY" PENICILLIN *

Observation period (days)	Negative		Significant drop in titre		No significant change in titre		Relapse or reinfection		Total	
	number	%	number	%	number	%	number	%	number	%
primary yaws										
31-60	3	42.9	3	42.9	1	14.2	—	—	7	100.0
61-90	5	83.3	1	16.7	—	—	—	—	6	100.0
91-180	5	62.5	2	25.0	1	12.5	—	—	8	100.0
181-340	1	100.0	—	—	—	—	—	—	1	100.0
secondary yaws										
31-60	1	2.7	23	62.2	13	35.1	—	—	37	100.0
61-90	1	8.3	8	66.7	3	25.0	—	—	12	100.0
91-180	10	22.7	24	54.6	10	22.7	—	—	44	100.0
181-340	2	10.5	13	68.4	4	21.1	—	—	19	100.0
"wet crab"										
31-60	1	1.7	14	24.6	42	73.7	—	—	57	100.0
61-90	2	4.1	20	41.7	26	54.2	—	—	48	100.0
91-180	1	1.5	48	71.6	18	26.9	—	—	67	100.0
181-340	2	6.6	23	76.7	5	16.7	—	—	30	100.0
total										
31-60	5	5.0	40	39.6	56	55.4	—	—	101	100.0
61-90	8	12.2	29	43.9	29	43.9	—	—	66	100.0
91-180	16	13.4	74	62.2	29	24.4	—	—	119	100.0
181-340	5	10.0	36	72.0	9	18.0	—	—	50	100.0

…ted from 9 June to 29 August 1951, maximum observation period . 128-209 days

TABLE VIII. RESULTS OF THERAPY BY STAGE OF YAWS ON PATIENTS TREATED WITH 1 ml (300,000 UNITS) OF "SATISFACTORY" PENICILLIN *

Observat on period (days)	Negative		Sign f cant drop in t tre		No sign f cant change in t t e		Relapse or re nfect on		Total	
	number	%	number	%	number	%	number	%	number	%
primary yaws										
31 60	3	100 0	—	—	—	—	—	—	3	100 0
61 90	1	100 0	—	—	—	—	—	—	1	100 0
91 180	1	100 0	—	—	—	—	—	—	1	100 0
181-340	—	—	—	—	—	—	—	—	—	—
secondary yaws										
31 60	1	5 6	13	72 2	4	22 2	—	—	18	100 0
61 90	6	50 0	6	50 0	—	—	—	—	12	100 0
91 180	4	44 5	3	33 3	2	22 2	—	—	9	100 0
181 340	—	—	—	—	—	—	—	—	—	—
"wet crab"										
31 60	—	—	5	31 2	11	68 8	—	—	16	100 0
61 90	—	—	6	60 0	4	40 0	—	—	10	100 0
91 180	1	5 6	13	72 2	4	22 2	—	—	18	100 0
181 340	—	—	—	—	—	—	—	—	—	—
total										
31-60	4	10 8	18	48 7	15	40 5	—	—	37	100 0
61 90	7	30 4	12	52 2	4	17 4	—	—	23	100 0
91 180	6	21 4	16	57 2	6	21 4	—	—	28	100 0
181-340	—	—	—	—	—	—	—	—	—	—

* Treated from 1 September to 27 October 1951, maximum observation period 69 125 days

TABLE IX SATISFACTORY OUTCOME BY STAGE OF YAWS AND BY AMOUNT OF PENICILLIN

Obse vat on pe od (days)	Unsat sfactory pen c l n — 2 m			Sat sfactory pen c n — 2 m			Sat sfactory pen c l n — 1 ml			Total		
	cases exam ned	negat ve or s gn ficant d op n t e		cases exam ned	negat e or s gn f cant d op n t t e		cases exam ned	negat ve or s gn ficant d op n t e		cases exam ned	negat ve or s gn f cant drop n t tre	
		numbe	%		numbe	%		numbe	%		number	%
					primary yaws							
31 60	3	3	00 0	7	6	85 7	3	3	00 0	13	12	92 3
6 90	4	4	00 0	6	6	100 0	1	1	00 0	11	11	00 0
91 180	7	6	85 7	8	7	87 5	1	1	00 0	16	4	87 5
8 340	9	9	100 0	1	1	100 0	—	—	—	10	10	100 0
					secondary yaws							
31 60	66	47	7 2	37	24	64 9	18	14	77 8	121	85	70 ^
6 90	63	46	73 0	12	9	75 0	12	12	100 0	87	67	77 0
9 180	108	93	86	44	34	77 3	9	7	77 8	161	134	83 2
8 340	150	38	9 0	19	15	78 9	—	—	—	169	153	90 5
					wet crab							
3 60	45	20	44 4	57	15	6 3	16	5	31 2	118	40	33 9
5 90	39	23	59 0	48	^2	45 8	10	6	60 0	97	5	52 6
91 180	73	54	74 0	67	49	73 1	8	14	77 8	58	117	74 1
181 340	86	79	91 9	30	25	83 3			—	116	104	89 7
					total							
31 60	1 4	70	6 4	01	45	44 6	37	^2	59 5	252	137	54 4
61 90	06	73	68 9	66	37	56	23	19	82 6	196	^9	66 2
91 80	188	153	81 4	1 9	90	75 6	28	2^	78 6	335	265	79 1
181 340	245	226	92 2	50	41	82 0	—	—	—	295	267	90 5

Clinical Relapse or Reinfection 1

Number	202 III	Date	21 2 51
Name	L V	Diagnosis	Secondary y
Age	4 years	Darkfield	Positive

Date	Days	Qualitative VDRL*	Quantitative dilutions	Qualitative Kahn	Quantitative Kahn	Units
21 2 51	0	P	64	4	444443–	128
13 10 51	235	P	64	4	44444441–	256 (re-trea
12 1 52	325	P	16	4	24432–	64

* P = positive

Patient was first seen on 21 February 1951 at which time the diagnosis of second yaws was made The following history was obtained Primary yaws, healed, on lower third of right leg Secondary lesions of the anal region were found Patient treated with 2 ml of penicillin (600 000 units) Patient was lost from observation u

period of time

Clinical Relapse or Reinfection 2

Number	B 674	Date	5 5 51
Name	B M	Diagnosis	Secondary ya
Age	7 years	Darkfield	Positive

Date	Days	Qualitative VDRL*	Quantitative dilutions	Qualitative Kahn	Quantitative Kahn	Units
5 5 51	0	P	128	4	34444444–	512
12 5 51	7	P	128	4	33344442–	512
17 6 51	43	P	64	4	44443–	64
25 8 51	112	P	64	4	444444–	128
6 10 51	154	WP		–		
13 10 51	161	P	64	4	2444441–	128 (re treat
20 10 51	168	P	64	4	244442–	128
17 11 51	196	P	32	4	44443–	64
24 11 51	204	P	16	4	44441–	32

* P = positive
WP = weakly positive

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SUMMARY

This study deals with the clinical and serological response of infectious yaws to one intramuscular injection of 2 ml (600 000 units) of procaine penicillin G in oil with 2% aluminium monostearate (PAM) as observed during the mass yaws eradication campaign in Haiti which was launched in July 1950 by the Yaws Eradication Service under the Ministry of Health and with the technical and financial assistance of WHO and UNICEF

Early studies suggested that in syphilis a high rate of cure could be achieved if a serum concentration was maintained for 72 hours with aqueous pen cill n With PAM it was found possible to maintain a blood level for that length of time with a single injection of 300 000 units (1 ml) and thus to achieve a significant rate of cure The cure rate could be increased by utilizing a dose of 600 000 units It was decided in the Haitian campaign to use the larger dose for the mass treatment of yaws

Other reasons for the decis on to use a dose of 600 000 units were that there was evidence to suggest that if a large number of but not all open lesions were healed, the transmission of yaws could be so reduced that the disease would not re establish itself to the same extent and that while with syphilis 4 800 000 units of PAM were needed to achieve a rate of cure of approximately 95% the lower dose of

RÉSUMÉ

Cet article est consacré à l etude de la reponse sérologique à l injection intra musculaire de 2 ml (600 000 unites) de pénicilline G procaïnee dans l huile avec 2% de monostearate d aluminium (PAM) chez des sujets atteints de pian infectieux Les observations relatées ont été faites au cours de la campagne d eradication du pian à Haïti entreprise en juillet 1950 par le Service d éradication dependant du Ministère de la Sante avec l aide technique et financière de l OMS et du FISE

Des etudes antérieures avaient montre qu un taux élevé de guerison de la syphilis pouvait être obtenu si une certaine concentration était ma ntenue dans le sang durant 72 heures l antibiotique utilisé étant la pen cill ne aqueuse On se rendit compte qu une seule inject on de 300 000 un tés (1 ml) de PAM permettait de maintenir un niveau suff sant pendant le laps de temps nécessaire et assurait de ce fait un taux de guérison appréciable Un taux superieur pouvait être atteint cependant au moyen de 600 000 unites Aussi cette quantite fut-elle adoptée pour la campagne de traitement systematique du p an à Haiti

D autres considerations venaient en outre appuyer cette decision on avait des raisons de penser qu en guerissant un grand nombre de lésions ouvertes sans pourtant les guérir toutes on réduirait la transmission du p an à tel point que la maladie ne regagnerait plus le terrain perdu en outre tandis que 4 800 000 unites de PAM etaient nécessaires pour assurer 95% de guérison dans la syphilis

600,000 units could be used for yaws The cost of penicillin would thus be reduced by an eighth

Bainet was selected as the control area as it was reasonably isolated, had a high incidence of yaws, and had no near-by facilities where other treatment might have been given It was realized that, in order to ensure the co-operation of the population, it would be necessary to treat not *only yaws but also any other ailments* that might be presented For this purpose, a general clinic was set up by the Government of Haiti The special yaws clinic was inaugurated in February 1951, and was open twice a week, on market days when persons from the surrounding countryside *came to the town* Case histories were noted and physical examinations carried out darkfield examinations were made of all lesions, and blood samples were subjected to quantitative Kahn and VDRL tests

Not only were all persons with lesions treated with 600 000 or, in a few cases, 300 000 units of PAM, but all members of their families were given 300,000 units as well, in order to avoid reinfection from family contacts who might be in the incubation stage

Where it could be arranged, follow up examinations were held at monthly intervals, but where this could not be done, they were held as frequently as possible There were some difficulties in maintaining continuity of observation and ensuring positive identification of the patients, and the means used to surmount these are described

In considering the results of treatment, the authors indicate that the 358 patients treated during the first four months were *given 2 ml of a preparation which failed* to maintain a satisfactory blood level through some defect in manufacture During the following two months, 221 patients received 2 ml of a satisfactory preparation, and, in September and October 1951, 57 additional patients were given 1 ml of the same penicillin

600 000 unites suffisaient pour lutter contre le pian Le cout de la pénicilline serait ainsi huit fois moindre

La région de Bainet fut choisie pour le traitement systématique, en raison de son isolement relatif, de la forte incidence du pian et du fait qu'auparavant, aucun traitement n'avait pu être appliqué, faute d'installations On comprit que, pour s'assurer le concours de la population, il *fallait traiter non seulement les pianiques* mais tout malade qui se presentait A cet effet, le Gouvernement de Haïti établit un dispensaire général Le dispensaire antipianique fut ouvert en février 1951 Les consultations avaient lieu deux fois par semaine, les jours de marche, alors que la *population des environs se rendait en ville* Les antecédents médicaux etaient notés, les examens généraux effectués, des prélèvements de toutes les lesions étaient examinés sur fond noir et des échantillons de sang soumis aux réactions quantitatives de Kahn et du VDRL (Venereal *Disease Research Laboratory*)

Tous les sujets presentant des lésions recevaient 600 000 unités de PAM — ou dans certains cas 300 000, les membres de leurs familles aussi recevaient 300 000 unités, afin que soit évitée la réinfection par des proches qui pouvaient être en période d incubation

Des examens post thérapeutiques ont été prévus, là où ils étaient possibles, mensuels lorsque les circonstances s'y prêtaient, sinon plus espaces Des difficultés s'opposèrent à la continuité des observations et au dépistage des malades, les moyens employés pour surmonter ces obstacles sont decrits dans l'article

Examinant les résultats du traitement les auteurs font remarquer que les 35 malades traités durant les quatre premier *mois reçurent 2 ml d'une préparation qu* n'assura pas un niveau d antibiotique suffisant dans le sang, à la suite d'un défaut de fabrication Au cours des deux mois suivants, 221 malades reçurent 2 m d une préparation satisfaisante, en septembre et octobre 1951, 57 autres malades reçurent 1 ml de la même penicilline

These three series of patients are analysed separately Tables and figures are given showing the distribution of patients by age and by sex according to the stage of yaws and the type and amount of penicillin given Other tables showing the results obtained, indicate that there were only four cases of relapse or reinfection out of the 636 patients treated—all four having received the unsatisfactory penicillin A final table summarizes the results according to the three schedules of therapy Another figure shows the results for the three series of patients combined, indicating that among the patients observed for more than six months satisfactory results were obtained in 100% of cases of primary yaws in 90 5% of secondary yaws cases and in 89 7% of "wet crab" cases

Since 600 000 units was the maximum dosage used the study does not indicate the optimum treatment for yaws but the authors consider the dosage adequate for mass treatment

An annex gives the case histories and results of serological testing of the four patients who suffered relapse or reinfection

Ces trois series de malades font l objet d analyses séparées L article contient des tableaux et figures montrant la répartition des malades par âge et sexe selon le stade de développement du pian le type et la quantité de pénicilline administree D autres tableaux indiquent parmi d autres résultats que chez les 636 malades traités seules quatre rechutes furent observées dues à la préparation de pénicilline insuffisante dont il a été question Un dernier tableau résume les résultats obtenus selon les trois schémas de traitement adoptes Un graphique donne l image des resultats combinés pour les trois series de malades On peut déduire de l observation de malades suivis pendant plus de six mois que le traitement a été satisfaisant dans 100% des cas de pian primaire dans 90 5% des cas de pian secondaire et dans 89 7% des cas de « crabe humide »

La dose maximum administree ayant été de 600 000 unités il n est pas possible de deduire de cette étude la dose optimum pour le traitement du pian Les auteurs considèrent la quantité susmentionnee comme convenant au traitement systématique

Les antécedents médicaux et les resultats des épreuves sérologiques effectuées sur les quatre malades ayant presenté des rechutes ou une réinfection figurent dans une annexe

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TIME-DOSAGE RELATION IN PENICILLIN THERAPY WITH SPECIAL REFERENCE TO YAWS

1. Laboratory Basis for Effective Therapy

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The discovery development and intelligent use of any specific therapeutic agent necessitates an orderly sequence of studies of its toxicity pharmacological action and clinical effectiveness In addition preferable routes of administration and suitable forms of preparation must be determined Even the most effective agent for the prevention treatment or cure of a disease is of little value if it is scarce toxic or unstable When penicillin was made available through the exigencies of the second World War problems immediately arose requiring determinations and measurements before it could be effectively applied

It was assumed but not proved that the concentration of penicillin in circulating fluids bears a definite physical relation to its existence at the tissue site of the infection Eagle[2] reported the belief that the laboratory in vitro sensitivity of an organism to penicillin represented a close approximation of its sensitivity at the site of the focus in vivo Eearly attempts were made to determine the amount of penicillin actually present in various tissues One difficulty encountered in arriving at true values in the case of tissue penicillin was the impossibility of extracting penicillin from tissue for assay without a portion of the extract representing serum penicillin Hence it would appear that a useful and accurate indication if not a very close representation of tissue penicillin is obtained by determining its concentration in the serum It therefore became necessary to design methods of measuring penicillin in the serum with sufficient accuracy to permit predictable correlation of its concentration with its bactericidal effect

Measurement of Antibiotic Activity

To date virtually total dependence for the measurement of the antibiotic activity of penicillin is placed upon microbiological assay Other methods

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such as the chemical[9] or spectrophotometric,[7] exist for the determination of penicillin, but are primarily of commercial use in growth, production purification, and control procedures The essential value of some of the newer electronic-microscope techniques,[15] moreover, is for research into the mode of action of the drug, they will not be discussed here The dependence upon the microbiological measurement of penicillin activity in circulating fluids is primarily due to the fact that the presence of natural inhibiting, deactivating, or augmenting factors makes either chemical or physical assay virtually worthless The two chief biological techniques used in testing for antibacterial activity are (*a*) the agar-diffusion method and (*b*) the broth dilution method

In the agar-plate method, a volume of solution of penicillin in appropriate dilution (0 025 to 2 0 Oxford units per ml) is applied, usually in a metallic cup or on a filter-paper disc, to the surface of agar suitably seeded with a susceptible organism In our microbiological assay laboratory in Bellevue Hospital, New York, we have studied the suitability of many organisms for this purpose *Sarcina lutea* has been selected by our group as the organism of choice, since its sensitivity to the diffused penicillin in the agar is in a range allowing accurate computation of the maximum killing power of each dilution The penicillin from the cup penetrates into the agar to the limit of its diffusion range, which is still inhibitory or lethal for the organism In this circular area, it kills and prevents growth, and produces a zone of clear agar, the diameter of which may easily be measured Comparison of the circular-zone size produced by the serum under assay with that obtained using a solution of a known standard allows assay calculation of potency in predetermined unit values (The conversion factor of Oxford units to micrograms is 1,667 units = 1 μg)

The broth dilution method measures the killing power of penicillin on organisms in nutrient broth Sterile broth is inoculated with a young culture of a suitable susceptible organism and equal volumes are transferred to the number of tubes desired Serum containing the penicillin to be estimated is then serially diluted, with narrow decrements, and added to the tubes The end points of partial or complete inhibition of bacterial growth produced by these decrements are read, either by the unaided eye or by any physical method, for determination of the degree of capacity or turbidity An interesting variant of this method is the use of broth containing whole blood and a test organism capable of lysing the blood By this technique, the end point becomes colorimetric, being the degree of the red colour produced by haemolysis of red cells in the presence of the actively growing haemolytic organism The serial dilution technique for penicillin detection was introduced by Fleming[5] as a slide-cell method whereby the actual number of viable test organism colonies was counted on a prepared microscopic cell block His first modification of this method was through the introduction of the haemolytic streptococcus test organism[6] wherein, rather than a

decreased number of colonies, the degree of haemolysis produced by the test organism was the measure This, too, was a microscopic cell chamber test, although adoption of the capillary-tube instead of the cell-count chamber was later made by Fleming's group Rammelkamp[16] introduced the macroscopic serial dilution test as we know it today Again, the end-point may be modified by the use of haemolysis and, as an added elabora tion sterility or simple inhibition of the diluent itself may be checked by culturing a loopful of inoculum on blood agar

Direct comparison of accuracy between the microscopic and macroscopic methods of serial dilution has been made by several workers, including Heilman & Herrell[8] who found the microscopic method to be more reliable in determining the concentration of penicillin in serum, and also more specific for the detection of very small quantities, the macroscopic serial dilution methods were, however, technically easier and therefore could be performed with greater consistency The Oxford cup or cup plate assay on solid agar was introduced by Abraham et al[1] and because of its convenience, has become widely used Kitchen, Thomas, Rein & Crutchfield[13] reported direct comparisons of two methods (macroscopic cup-plate and macroscopic serial dilution) of penicillin assay and gave preference for accuracy, practicability, and reproducibility to the cup-plate technique, using *S lutea* as the test organism We now employ this method almost exclusively in our laboratory

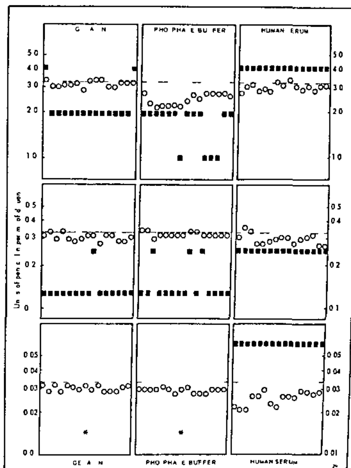
Recently, in an attempt to improve still further the quantitative accuracy of penicillin determinations Sager & Arrigoni[18] have revived an old bacteriological principle and adapted it to microbiological assay This utilizes the ability of certain micro-organisms to produce acid The test organism, an acid former, was adjusted to functional concentration by serial dilution techniques and the amount of acid produced in the media titrated electrometrically for detection of the end point According to the authors, this method, when compared with the other two standard methods of analysis, indicates an average error of 7 8% as against one of 11 1% for the Oxford cup and one of 11 6% for serial dilution Clearly, the statistical significance of assay values obtained will depend upon the test employed, the number of replicates assayed, the accuracy of the determination of the standard, the type of sample being assayed, and even upon the laboratory or technician performing the tests, since it is a direct reflection of the bacteriological techniques

All these biological methods have been successfully used for determining the concentration of penicillin in serum, cerebrospinal fluid, effusion fluids, pus, sputum, etc In each instance, the technique must be standardized to a [illegible]

technique carried out by expert workers, we need assume only a ±10%

error, which is quite acceptable for the average comparative biological testing procedure

FIG 1 PENICILLIN ASSAY COMPARISONS WITH VARIOUS DILUENTS



○ Cup plate assay (test organism *Sarcina lutea*)
■ Serial dilution assay (test organism *Bacillus subtilis*)
Known standard penicillin concentrations
* Serial dilution method not sensitive at a concentration of 0 033 unit of penicillin per ml gelatin or phosphate buffer

Determination of Factors Affecting Therapeutic Action

After the safety and efficacy of a drug have been established, the rational approach to its clinical use depends upon adequate studies of its absorption distribution, fate, and excretion Penicillin in soluble forms (sodium potassium, and calcium salts) is more rapidly absorbed from parenteral

ites than following oral administration Its rate of excretion, on the other hand, is extremely rapid The urinary excretion of the soluble salts of penicillin after their injection is so rapid and so consistent that their use as a method of determining kidney function instead of such preparations as Diodrast has been suggested [4]

The complete mechanism or mode of action by which penicillin exerts its killing effect is not entirely understood, but from a practical point of view, its therapeutic action is definitely determined by factors inherent in the susceptibility of the organism to the drug Many of these factors have not yet been elucidated, in vitro studies have, however, demonstrated that the susceptibility of a given organism may be thus defined in terms of concentration

(*a*) that which suffices only to reduce the normal rate of multiplication (considered to be the bacteriostatic level),

(*b*) that which kills the organisms faster than they multiply (sometimes called the in vitro inhibitory level),

(*c*) that which kills the organisms at a maximal rate (e g, for *Streptococcus pyogenes*, these concentrations are approximately 0 007, 1 014, and 0 0109 units per ml)

Some factors other than concentration governing therapeutic efficacy of penicillin are (*a*) the time required to kill, and (*b*) the number of organisms initially present in the infected host, (there may be an eightfold difference in the time required to sterilize suspensions of one thousand and one million organisms per ml)

A comparison of these several factors on common pathogens has been given by Eagle & Musselman (cited by Eagle [2])

From table I it may be noted that the length of time required to kill 99 9% of *Treponema pallidum* in vitro after exposure to maximally effective concentrations of penicillin is from 25 to 35 hours It is extremely interesting that, in contradistinction to the killing time of *T pallidum* determined by in vitro studies, the treponeme "begins to disappear from a primary lesion in rabbits only four to six hours after the administration of even large doses of penicillin" [3]

Laboratory in vitro and in vivo studies have not indicated any consistent variation in the susceptibility of the treponemes of venereal syphilis, endemic syphilis, yaws, or bejel to penicillin The International Treponematoses Laboratory Center of the World Health Organization at the Johns Hopkins University, Baltimore, Md (Dr T B Turner, personal communication) has noted that "While, therefore, these findings are fragmentary thus far, we have had no suggestion that any of the collected strains are more resistant to penicillin than the strains of *T pallidum*" [a]

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[a] See article on page 7

TABLE I EFFECTIVE LEVELS OF PENICILLIN G FOR A NUMBER OF BACTE

Infect ng organism	Concentration of penicillin G (µg per ml) ** wh ch sufficed to			Time required to k l 99 9% o organ sms at opt mal concentra t ons of penic ll n (hours)	Propo of orga surviv ng 6 hou expos to max effect concer t ons penic l
	reduce rate of growth	k ll organ sms slowly	kill organ sms at max mum rate		
Streptococcus pyogenes (C ^03)	0 004	0 006 0 008	0 064	1½ 2	0 002-0
Pneumococci (Types 1 3 8 12 14 24)	0 008-0 012	0 024	0 064	3 5	0 03
Staphylococcus aureus					
6 suscept b e stra ns	0 016-0 024	0 024 0 064	0 064-0 25	5 20	0 05 1
1 resistant stra n	0 25	1	16	11	6
Treponema pallidum (Reiter)	0 016	0 032	1±	25-35	5 1(
Streptococcus faecalis					
5 suscept ble stra ns	1	2 4	4-6	5	0 0
2 res stant stra ns †	1	3-4	4 6	>48	10 5

* From Eagle [3] (by kind permission of the editors of the *Annals of Internal Medicine*)
** To transform to units multiply by factor 1 7 (1 mg = 1 667 units)
† Resistant in that organisms were killed only slowly even at optimal concentratic penicillin

It is possible to demonstrate the extreme sensitivity of *T pallidu* penicillin in vitro, as little as 0 0025 unit of penicillin per ml immobil 50% of the organisms in 16 hours [11]

In arriving at the time dose relation in penicillin therapy of yaws, necessary to make deductions from fundamental studies with other ponemes, particularly *T pallidum* That the deductions made fror *pallidum* can be applied to *T pertenue* is indicated not only by ex laboratory data, but also by actual results of therapy administered on basis (Rein & Kitchen [b])

Since in vitro and in vivo laboratory reports form, at best, onl indication for suggested dosage schedules to be applied in man, any tinent information gained from clinical experience with the therap treponemal diseases is of value We have observed that patients with e syphilis may be cured with doses of penicillin that give little or no detect serum concentrations by our present methods While it is not prop to deal here with the clinical basis of the time dose relation in penic

[b] See article on page 91

therapy of these diseases, it is pertinent for correlation to report that Dr E W Thomas (personal communication) has observed 11 patients with early syphilis clinically and serologically for one year or longer, following the oral administration of amorphous penicillin in doses of 75,000 units, seven times a day for 70 doses, to a total of 5,250,000 units After this period of time, 9 of the 11 remained seronegative, 2 of the patients with secondary syphilis having relapsed or become asymptomatically reinfected Serum penicillin values were so low as to be immeasurable most of the time in most of these patients

While we were convinced that, for a number of reasons, the oral route of administration was not preferable for the treatment of yaws or any treponemal disease, we reported[12] serum concentrations of penicillin following the oral administration of microcrystalline procaine penicillin G, and compared these effects with similar dosages of sodium penicillin G The amounts given of both of these oral preparations were larger than had been reported by previous investigators From this work we reached the conclusion that no means of administration of existing oral preparations in single doses would give circulating fluid concentrations sufficiently persistent to prove satisfactorily effective against the treponemal organisms

From laboratory studies, including those mentioned above, and from the clinical experience of other workers, such as Mahoney & Arnold (personal communication), the Syphilis Co operative Study Section of the National Research Council, and our own group, it was felt that for the most satisfactory treatment of syphilis, penicillin should remain in circulating fluids for an uninterrupted minimal period of 96 to 144 hours in an effective concentration (absolute minimal unknown)

This duration dose requirement appeared to be obtainable with any penicillin preparation but was more practicable with one that would exhibit a sufficient repository action to avoid the necessity of frequent injection of the rapidly excreted soluble salts of the antibiotic Calcium penicillin in peanut oil and 4 8% beeswax was the first approach to the successful application of these conditions The problem of maintaining penicillin in circulating fluids for a long period of time, with a single or few injections, was then further reduced by the development of microcrystalline procaine penicillin G in oil gelled with 2% aluminium monostearate (PAM)

Studying the repository action of this preparation Kitchen, Thomas & Rein[11] reported serum concentrations following its intramuscular injection according to several schedules of administration It was initially observed that the daily injection of 1 ml (300,000 units) of PAM daily for 15 days resulted in a progressive serum accumulation of penicillin This began with a serum concentration of 0 1 unit per ml 24 hours after the first injection, attaining an average of about 0 4 unit per ml by the 8th day, and maintaining this same level until injections were discontinued A similar phenomenon resulted from the injection of the same amount at 48 hour

intervals, although the accumulation rate was slower and the serum-concentration level, at the end of the 8th day, was lower, being approximately 0 2 unit per ml We also reported[11] serum concentrations of penicillin following the "single treatment" schedules with this preparation as follows

Schedule	*Dose*
K_1 (one depot)	1.2 million units (4 ml)
K_2 (one depot)	2 4 million units (8 ml)
K_3 (two depots, simultaneously)	2 4 million units (4 ml each)

The K_1 schedule produced a peak level of approximately 0 5 unit per ml in one hour and remained above 0 03 unit per ml for 6-8 days in the great majority of instances The K_2 and K_3 schedules produced serum concentration at the one hour peak of approximately 1 0 unit per ml A gradual decline in the level which fell below 0 03 unit per ml, occurred in about 8 to 10 days in most patients

From these results, it appeared obvious that the postulate that the serum should maintain an uninterrupted, measurable concentration of penicillin for 6 8 days could be fulfilled, and that the next logical step in our attempt to reduce the effective treatment of syphilis, yaws, or pinta to a single injection might be possible In order to determine the time dose relation in the transfer of penicillin from the mother to the new born, we undertook a study[10] of 181 normal women, who delivered their babies at intervals varying from a few minutes to 15 hours after a single injection of 300 000 units of PAM In instances where delivery was effected within minutes or the first few hours following injection of the mother, the concentration of penicillin in the cord serum was quite low, and indeed absent in some cases In general if 4 hours or more elapsed between injection of the mother and delivery, the cord serum penicillin was much higher, only two or three failed to demonstrate the presence of the antibiotic The most favourable transfer was effected when PAM had been injected between 6 and 12 hours before delivery These findings are significant and the implications are discussed by Rein & Kitchen[c]

Soon after PAM became available, marked variations in its chemical, physical and repository characteristics were discovered in preparations from different sources The uniformity and reproducibility of all its properties are a direct reflection of the accuracy of the methods of manufacture, which since the control of unusual physicochemical phenomena are involved, must be meticulously and consistently carried out The discovery of this lack of uniformity in PAM preparations from different sources resulted,

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[c] See article on page 91

in 1950, in a detailed study of the problem in which the United States Food and Drug Administration and a committee composed of research and control representatives of certain PAM producers and penicillin manufacturers collaborated closely

It is obviously not feasible to subject every lot of PAM to assay in man, hence, the purpose of this committee was to explore possible laboratory animal or in vitro methods which might predict the repository effectiveness of individual lots Further, the committee was requested to design experiments to determine whether significant differences existed between the serum assays for penicillin performed in different clinics The results of all these studies are too lengthy for detailed description here, however, one in vitro method [d] is sufficiently simple in its performance and consistent in its correlation with actual clinical assay to be particularly promising. Its principle is based on the extent to which the penicillin placed in a standard metallic cup on a previously prepared and seeded agar plate will diffuse in a circular zone around the cup and kill or inhibit the growth of organisms In this respect the technique and mechanics of diffusion are identical with those utilized in any standard cup plate procedure for determining the amount of penicillin in fluids such as serum The various PAM samples to be tested for diffusion are placed in cups on the same plate with an identical amount of the United States Food and Drug Administration standard of crystalline sodium penicillin G in aqueous solution (1% phosphate buffer, pH 6 0)

The zone diameter sizes produced by the diffusion under standard conditions allow calculation with subsequent interpretation of repository effect From the studies of the Industry Committee of the Food and Drug Administration and from our own observations, there appears to be a rather constant and definite inverse relation between the zone size produced by PAM and its duration in the serum of the human subject following parenteral administration Stated differently, a given lot of PAM which produces a very small zone of diffusion appears to be correlated with long duration in the serum whereas large zone preparations appear to be associated with higher, but shorter, blood concentrations Further correlating studies will be necessary to define more closely the relation between agar diffusion and serum concentration The statistical treatment of a rather large amount of material is being performed and will be published subsequently by the designers of the diffusion assay method [d]

Since most of the present schedules being used in yaws control campaigns have been based largely on PAM serum assay studies and since such wide variation in similar preparations produced throughout the world has been noted, it is our feeling that definite specifications should be required of PAM products where comparable schedules are advocated All PAM

[d] Bristol Diffusion Procedure Bristol Laboratories Inc Syracuse N Y

studies and therapeutic experience have indicated that the demonstrable sensitivity to penicillin of *Treponema pallidum* is also applicable to *T. pertenue*

For the treatment of syphilis an effective concentration of penicillin must be maintained in the blood over a minimal period of between 96 and 144 hours It was found that oral administration of penicillin in single doses did not give a circulating-fluid concentration sufficiently persistent to prove effective against treponemal organisms The question of intramuscular administration brings the authors to a consideration of the time dose relation, the clinical aspects of which they discuss in a second contribution to this Symposium Here they describe the basic studies undertaken to devise a preparation with a sufficient repository action to obviate the necessity for frequent injections of the rapidly excreted soluble salts of the antibiotic The development of PAM, which solved this problem, was followed by the drawing up of optimal schedules of administration, offering the possibility of effective single injection mass treatment for syphilis, yaws, and pinta A new difficulty then arose, however marked variations in chemical, physical, and repository characteristics were noted in PAM preparations from different sources Possible laboratory-animal or in vitro methods of predicting the repository effectiveness of individual lots were therefore sought and an agar-diffusion technique which allows the expected serum concentration to be calculated was developed

The authors stress the need for definite specifications for penicillin preparations, and in an annex give their personal recommendations, which approximate closely to the specifications for PAM recommended by the WHO Expert Committee on the *International Pharmacopoeia*, and approved by the WHO Expert Committees on Venereal Infections and Treponematoses, and Biological Standardization

n'a pu être observée. Des essais in vitro et les observations faites en thérapeutique ont montré que la sensibilité expérimentale de *Treponema pertenue* est la même que celle de *T. pallidum*

Pour que le traitement de la syphilis soit efficace, il faut qu'une certaine concentration de pénicilline soit maintenue dans le sang durant une période minimum, variant de 96-144 heures Or, on constata que l'administration orale d'une dose unique n'assurait pas une concentration suffisante assez durable pour qu'elle soit active contre les tréponèmes La question de l'administration par voie intramusculaire amène les auteurs à discuter le rapport temps/dose, dont ils ont envisagé les aspects cliniques dans un autre article de ce Symposium Ils mentionnent ici les études entreprises pour mettre au point une préparation ayant une action retard assez forte pour remplacer les injections fréquentes de sels solubles de la pénicilline, rapidement éliminés La mise au point d une préparation de pénicilline G dans l'huile avec 2 % de monostéarate d'aluminium (PAM) a resolu ce problème Des schémas de traitement furent ensuite proposés grâce auxquels, au cours des campagnes systématiques, la syphilis, le pian et la pinta pouvaient être traités avec succes au moyen d une injection unique *Une nouvelle difficulté surgit alors* Des préparations de PAM de diverses origines presentèrent des différences dans leurs propriétes physiques, chimiques et leur action-retard On chercha, en conséquence, des methodes de laboratoire permettant de déterminer l'action retard de lots d'antibiotiques et l'on mit au point une technique de diffusion sur gelose d'après laquelle il est possible de calculer le niveau probable de penicilline dans le sérum

Les auteurs soulignent la nécessité de normes precises pour les préparations de PAM et, dans une annexe, ils font à ce sujet des propositions qui se rapprochent des recommandations formulées par le Comité d'experts de la Pharmacopée *internationale et par le Comité d'experts* des Maladies vénériennes et des Tréponématoses, ainsi que par le Comite d'experts pour la Standardisation biologique, de l'OMS

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TIME-DOSAGE RELATION IN PENICILLIN THERAPY WITH SPECIAL REFERENCE TO YAWS

2. Clinical Basis for Effective Therapy

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Numerous studies on the efficacy of penicillin therapy in yaws have been made since the first report in 1943 by Mahoney, Arnold & Harris [19] on the value of this antibiotic in syphilis [3-12, 15, 22, 23, 25, 27, 29, 30] At that time, however, there was no definite knowledge about the total dosage of penicillin required for the satisfactory treatment of early syphilis or of the other treponemal diseases As occurs in the case of many new therapeutic agents, some of the reports dealing with yaws [16] appeared inconclusive and the results they recorded were interpreted as unsatisfactory Thus, there are physicians who still believe that penicillin is not the drug of choice in the treatment of yaws and that other antibiotics may be preferable Why do some reports still state that penicillin is less satisfactory than the other antibiotics, and what are the errors in the interpretation of results ? It is believed that the following discussion on the time dose relation from the clinical point of view may explain some of these discrepancies

Factors in Penicillin Therapy

Dosage

At the time when preliminary investigations with penicillin were in progress, supplies of the drug were limited and very little could be allotted for the treatment of yaws As a result, schedules were based on a total dosage of 300,000 to 600 000 units of aqueous penicillin It was soon learned that although all patients with early yaws who received this relatively small amount of penicillin were rapidly rendered non infectious, relapses occurred Some investigators were unduly influenced by these unsatisfactory results It is now an accepted fact that there is a minimal total dosage of penicillin which must be administered if satisfactory results are to be obtained below this dosage, the smaller the amount, the higher will be the failure rate

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Duration

Patients with early syphilis were originally treated by Mahoney and his associates [20] with aqueous penicillin over a period of 7½ days Some investigators felt that a more rapid method of therapy was possible and necessary for the treatment of yaws Schedules were introduced whereby aqueous preparations were administered over a period of 3 days or less, and again a high percentage of treatment failures followed It has subsequently been shown [17] that the time dose relation is most important and that there is a minimal time during which penicillin must be maintained in tissues and circulating fluids to be effective When the total dosage was kept constant, the longer the period taken to administer the penicillin (within certain limits), the more effective was the therapy Arnold et al [1] have analysed the results of their studies in developing penicillin therapies undertaken from 1943 to 1950 in the Venereal Disease Research Laboratory of the United States Public Health Service They concluded that an adequate concentration of penicillin must be maintained in the body for at least 3 days They state

> The favourable response to 3 days of adequate penicillin serum concentration appeared to be the key to the solution of the time factor in the ambulatory management of syphilis and to the effective utilization of slowly absorbed penicillin salts in repository vehicles

We have already discussed [a] the work of Eagle, Magnuson, and Turner on the marked sensitivity of the treponemes to low concentrations of penicillin and the fact that the actual killing time is longer for *Treponema pallidum* than for other pathogens, indicating the necessity of maintaining adequate levels of penicillin in the serum for a sufficient period of time The same is undoubtedly true in the therapy of yaws Unless there is an adequate and uninterrupted maintenance of penicillin levels at the site of the infection, failures will occur

Serological response

Although most physicians were apparently satisfied with the rapid disappearance of treponemes from the early lesions of yaws and the dramatic healing of cutaneous manifestations there were some who were disappointed by the slow serological response The pessimism caused by this lag in serological reversal is unwarranted, it has been shown that months and even years may elapse after successful therapy for yaws with any type of treponemicidal agent before the serological response ultimately becomes negative Many patients with secondary yaws may have had the disease for several years before the institution of therapy, the same rapidity of serological reversal to negativity as in secondary syphilis, where the disease has been

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[a] See article on page 77

present for only a few months, should not, therefore, be expected It must be realized that the response in high-titre secondary yaws and latent yaws of long duration may be extremely slow Furthermore, unless carefully performed quantitative tests are done at frequent and regular intervals on yaws patients with high titre reactions, it may not be possible to determine whether therapy has been followed by a satisfactory trend towards serological reversal The persistence of positive results to serological tests does not necessarily indicate the persistence of infection

Immunity

Some investigators were discouraged by the results of penicillin therapy for yaws because they were of the opinion that the so called relapse- or failure rate was excessive Unfortunately, it is often quite difficult to differentiate between relapse and reinfection Since yaws may be clinically cured in a relatively short period of time, it is possible for a patient treated for early infections to be reinfected by subsequent re-exposure, especially if he returns to his original environment in which there is a high incidence of untreated infectious yaws Whether or not an adequately treated patient with early yaws will develop a new infection will depend on the extent of immunity he has developed from his original infection The degree of his immunity is greatly dependent upon the duration of the original infection before therapy and the extent of the re-exposure

The question of cross immunity between yaws and syphilis requires clarification Turner [28] has reported on the increased resistance to yaws in man infected with syphilis Schobl & Miyao [24] have shown in experiments with monkeys that yaws affords protection against syphilis McLeod & Magnuson [18] have recently reported on their studies of cross immunity between syphilis and yaws in rabbits with infections of 7 10 months' duration before treatment was instituted They found that both rabbits with syphilis and those with yaws failed to develop lesions upon re inoculation with the homologous strain of treponemes In addition, they were able to demonstrate that rabbits originally infected with syphilis developed only a low degree of immunity to re-inoculation with yaws treponemes, whereas rabbits originally infected with yaws showed little or no immunity to re inoculation with as few as 100 syphilis treponemes Of special interest was the important observation that serum from the rabbits with yaws, which were not immune to syphilis, possessed a high degree of immobilizing activity against *T pallidum* as determined with the treponeme immobilization test [21] They concluded, contrary to earlier investigators, that no significant degree of cross protection was found in animals treated 7-10 months after infection

It is quite possible, therefore, that patients cured of yaws in early childhood may be reinfected with yaws or may acquire syphilis in later life

If the only evidence of an asymptomatic reinfection with yaws or of a new asymptomatic infection with syphilis is a rise in serological titre it would be almost impossible with our present methods to distinguish these conditions from a serological relapse Therefore, an increase in serological titre, without the reappearance of clinical yaws, in patients who had received adequate treatment for a previous early infection does not necessarily indicate a treatment failure and, therefore, when such reinfections are classed as failures, there is a false reduction in the cure rate

Reactions

Despite the tremendous increase in the use of penicillin in the United States of America, there has been an actual decrease in the incidence of all types of penicillin reactions This decrease has probably been due to the purification of penicillin products, and the abandoning of peanut oil and beeswax preparations, undoubtedly it has also been aided by the introduction of procaine penicillin In an effort to gain information about the trend in type and incidence of penicillin reactions, the problem was examined from three angles [13] For the period 1947 50, an analysis has been made of (*a*) the relation between the reported total reactions and the total production of penicillin, (*b*) the opinion of experts who have had extensive experience in the use of penicillin, and (*c*) reactions to penicillin which have occurred in subjects receiving the drug in a large hospital in the eastern USA. All three methods of approach have indicated that the total number of reactions to penicillin has remained low, despite an enormous increase in its use When considered in terms of the trillions [b] of Oxford units of penicillin prescribed, the incidence of reactions is falling impressively

Clinical and Serological Studies

Clinical studies based on the penicillin assay investigations by Kitchen, Thomas & Rein [14] were initiated to determine the efficacy of penicillin therapy in yaws, syphilis, and pinta Treatment schedules were selected on the basis of the type of repository penicillin employed In all instances schedules were selected that would ensure the proper time dose relation so that an adequate therapeutic level of penicillin was maintained in the patients for a minimum of 96 hours The WHO Expert Committee on Venereal Infections and Treponematoses has also considered the important matter of the time-dosage relation, particularly as it applies to mass treatment, and has expressed the following opinion [31]

"There is now evidence to support the view that, with penicillin a high proportion of cures can be obtained in early infectious treponemal infections (syphilis, yaws bejel,

b American trillion = 10^{12}

pinta) if therapeutically effective serum concentrations are maintained for a minimum of 4 to 6 days 'Penicillin free' intervals in the serum should not exceed 24 hours, and the frequency of injections should be adjusted according to the immediate or delayed-effect characteristics of the penicillin preparation used

"Procaine penicillin G in oil gelled with 2% aluminium monostearate, microcrystalline 5 μ (internationally designated PAM) is now the preparation of choice and it should be used in the treatment of early infectious treponemal infections with due regard to the above facts

"For mass campaigns it is recognized that penicillin must be conserved so far as is compatible with effective public health results There is however, a limit below which the total dosage of penicillin is not compatible with effective results in a sufficiently high percentage of cases

"As a compromise between maximum efficacy and practical expediency it is suggested that field teams consider 1 2 million units of PAM to be the minimal dosage for the treatment of early infectious lesions in adults

"It is suggested to field teams engaged in mass campaigns that they administer on the day the diagnosis is established the full minimal total dose indicated above Following this whenever feasible from the standpoint of field operations, a further injection may be given 3 to 5 days later "

Blood specimens were obtained from all our patients before therapy, and the sera were subjected to a battery of quantitative serological tests The number and type of tests employed depended upon procedures that were available in the laboratories of the country in which the study was conducted After therapy, the patients were subjected to a clinical and serological follow up at 1- to 3 month intervals for 1-3½ years

In order to evaluate the serological results obtained, the following arbitrary criteria and definitions were accepted

(a) *serological cure* this denoted seronegativity attained and maintained after treatment,

(b) *serological improvement* this denoted a reduction in serological titre, indicating a satisfactory serological response, but seronegativity not attained at the time of the last examination,

(c) *serological fastness* this indicated failure to show a reduction in serological titre below the pre treatment level,

(d) *serological relapse* this constituted an initial reduction in serological titre followed by a sudden and progressive increase in titre, indicating an unsatisfactory response or an asymptomatic reinfection

Yaws

With the co operation of the Haitian Government, and in collaboration with Petrus, we initiated a study on the efficacy of penicillin therapy in yaws, the clinical and serological results in a series of 1,200 Haitian peasants with early manifestations of the disease were then evaluated

The patients, who were treated on an ambulatory basis with crystalline sodium penicillin G in peanut oil containing 4 8% beeswax (Romansky

formula), were divided into three groups

Group A 450 patients, treated on a 4-day schedule and receiving one injection of 1 ml (300 000 units) of penicillin once a day, to a total dose of 1,200,000 units,

Group B 492 patients, treated on a 2 day schedule, and receiving one injection of 1 ml twice a day at 12 hour intervals, to a total dose of 1 200 000 units,

Group C 258 patients, treated on a 4-day schedule and receiving one injection of 1 ml twice a day at 12 hour intervals, to a total of 2 400 000 units

Whenever possible, the patients' siblings and parents with tertiary or latent yaws also received penicillin therapy in order to reduce the incidence of reinfection as much as possible It is estimated that approximately 2,000 additional patients were thus treated, they are not included in this report All patients within each group, regardless of age or weight, received the same therapy

Table I shows the total number of patients initially treated and the number in each group followed successfully for a period of one year it is interesting to note that in spite of the difficulties, 787 were re-examined clinically and serologically at the end of the twelve month period, giving a follow up of 65 6%

TABLE I SEROLOGICAL RESULTS IN 3 GROUPS* OF YAWS PATIENTS ONE YEAR AFTER TREATMENT

Group	Number		Serological cure		Serological improvement		Cure and improvement (%)	Serological *fastness* (number)	Serological *relapse* (number)	Fastness and *relapse* (%)
	treated	followed	number	%	number	%				
A	450	312	115	36 68	173	55 44	92 30	21	3	7 69
B	492	314	122	38 85	163	51 91	90 76	26	3	9 23
C	258	161	79	49 06	73	45 34	94 40	8	1	5 59

* For treatment schedules of these groups see above

It will be seen that a rate of serological cure and improvement (determined according to the definitions given on page 95) of 90 7% was obtained even in Group B, which showed the least favourable results The best results—94 4%—were obtained in Group C Thus, with an identical total dosage, the 4-day schedule (Group A) was more effective than the 2 day schedule (Group B), and with an identical total duration of therapy 2 4 million units (Group C) was more effective than 1 2 million units (Group A)

From the clinical point of view, the results were rapid, with the second injection the patient felt much better, and headaches and joint pains had

disappeared Plantar and palmar crab lesions became painless by the 4th day Primary and secondary lesions were in the desiccation stage in 4 days, at which time the crusts could be easily removed revealing a dry and well healed underlying skin Complete healing of all lesions was observed in most instances on the first re-examination 3 months after completion of therapy

The following data show the clinical results at the end of the one year study period, the extremely high cure and improvement rate and the extremely low percentage of patients exhibiting no clinical change are characteristic of the clinical response to this type of treatment

Group	Cured (%)	Improved (%)	No change (%)
A	95	3	2
B	94	4	2
C	98	0	2

There were no proved instances of clinical reinfection or relapse in the patients followed for one year

Pinta

In co operation with Marquez and Varela, we initiated a study on the efficacy of PAM for the treatment of pinta and evaluated our serological and clinical results in a series of 665 Mexican patients Four schedules of therapy were used

Schedule A a single injection of 4 ml (1 200,000 units),

Schedule B one daily injection of 1 ml (300 000 units) for 4 days 1,200 000 units)

Schedule C one weekly injection of 4 ml (1 200 000 units) for 4 weeks 4 800 000 units),

Schedule D one weekly injection of 1 ml (300 000 units) for 4 weeks 1,200 000 units)

All patients within each group, regardless of age or weight, received he same therapy

The total number of patients initially treated with each schedule and the umber in each group re examined for a period of at least one year together vith the serological results for each of the four treatment schedules at the nd of the ...

lule

ogical response to shortened courses of ambulatory penicillin therapy It s to be expected that there will be more serological cures during the third year of re-examination

Although the serological response was much slower than in our syphilis patients, and somewhat slower than in our yaws patients our results were

far better than those reported by other investigators after heavy metal therapy The slowness of the serological response is probably a direct *reflection of the duration of the disease* A large number of our patients with pinta had had the disease for many years before treatment

TABLE II SEROLOGICAL RESULTS IN PINTA PATIENTS ONE YEAR AFTER TREATMENT, ACCORDING TO FOUR SCHEDULES* OF THERAPY

Schedule	Number		Serological cure		Serological Improvement		Serological fastness		Serological relapse	
	treated	*followed*	*number*	*%*	*number*	*%*	*number*	*%*	*number*	*%*
A	392	214	42	19 62	116	54 20	55	25 70	1	0 46
B	11	6	1	16 66	1	16 66	4	66 66	0	—
C	29	12	4	33 33	2	16 66	4	33 33	2	16 66
D	233	118	23	19 49	63	53 38	31	26 27	1	0.84

* For treatment schedules see page 97

The clinical results were not as rapid as those we obtained with penicillin therapy in yaws and syphilis In pinta, from 4 to 6 months elapsed before the primary or early secondary lesions disappeared The late secondary lesions required from 6 to 12 months for complete healing Of special interest was the observation that in patients with leukoderma (white pintids) of short duration, there was a reappearance of normal pigment

From the following figures, showing the combined clinical results with all four treatment schedules it will be noted that all patients with primary lesions attained and maintained clinical cures

	Primary lesions (16 patients)		*Secondary lesions (151 patients)*		*Late manifestations (183 patients*)*	
	(number)	*(%)*	*(number)*	*(%)*	*(number)*	*(%)*
Cured	16	100	104	68 9	74	40 4
Improved	—	—	47	31 1	91	49 7
No change	—	—	—	—	18	9 8

* Including 97 patients with intermediary manifestations

There were no proved instances of clinical relapse or reinfection in those patients followed for from one to two years

Of patients with early pintides 68 9% had attained and maintained a clinical cure while the remaining 31 1% had shown a marked clinical improvement at the time of their last examination Only 18 patients (9 8%) with late pinta followed for more than one year, failed to show any appreciable clinical response The results from a single injection of 4 ml appeared somewhat better than those from an injection of 1 ml once weekly for 4 weeks, even though the total dosage (1,200,000 units) was identical in both schedules

Syphilis

In co operation with Thomas and Landy, we initiated a study on the efficacy of single injection treatment with PAM in early syphilis at Bellevue Hospital, New York, in May 1948 To date, we have treated 145 patients, who have been carefully followed, clinically and serologically, for from 9 to 40 months after completion of therapy All except 16 patients have been followed for well over one year We do not wish to give the impression that we advise a single injection treatment for secondary syphilis as a routine procedure It was our prime purpose to determine what could be accomplished by such therapy, since this information would be of value in those areas of the world where a single injection might be the only practicable treatment Our recommendations for the routine therapy for early syphilis as well as for other stages of the disease have appeared in a recent publication [2]

Originally, we administered a single injection of 1,200,000 units or 2,400,000 units of PAM, but since June 1950 we have been treating alternate cases of early syphilis with a single treatment of 2,400,000 or 4,800,000 units of PAM Owing to the marked decrease in new cases of early syphilis, however, collection of data on these last two schedules of therapy is proceeding very slowly

Since the serological results of treating primary syphilis are better than those following treatment of secondary syphilis, it is essential to classify our data according to the type of early syphilis treated The tabulation below gives the data on 42 patients, with seronegative or seropositive primary syphilis, treated with a single injection of 1,200 000 or 2,400 000 units of PAM, it will be noted that all had attained and maintained sero negativity when last examined

	Number of patients	
Stage	*treated*	*attaining seronegativity*
Seronegative primary *	7	7
Seronegative primary **	4	4
Seropositive primary *	21	21
Seropositive primary **	10	10

* Treated with 1 200 000 units followed for from 13 to 40 months
** Treated with 2,400 000 units followed for from 9 to 40 months

Data on 86 patients with secondary syphilis treated with single injections of PAM are given in table III Although the results are less dramatic than those observed in patients with primary syphilis receiving similar schedules of therapy, it is gratifying to know that with the 1,200,000-unit schedule only 11 1% had to be re treated because of relapse or reinfection The reasons for re treatment may be tabulated as follows

Original treatment (units)	*Reason for re-treatment*					
	seroresistance		*reinfection*		*relapse or reinfection*	
	(number)	*(%)*	*(number)*	*(%)*	*(number)*	*(%)*
1 200 000	4	6 3	1	1 5	7	11 1
2 400 000	—	—	—	—	1	4 3

An analysis of the figures in table III will show that 81 % of the patients treated with 1,200,000 units and 95 7 % of those treated with 2,400,000 units showed serological cure or improvement

TABLE III RESULTS OF SINGLE INJECTION TREATMENT IN 86 PATIENTS WITH SECONDARY SYPHILIS

Dosage (units of PAM)	Number of patients	Serological cure		Serological improvement		Re treatment required	
		number	%	number	%	number	%
1 200 000	63	40	63 5	11	17 5	12	19 0
2 400 000	23	18	78 3	4	17 4	1	4 3

The patients classified under the heading "serological improvement" had a marked reduction in titre compared to their pre-treatment titres It is to be expected that many of these individuals will attain seronegativity as the follow up period is prolonged The marked reduction in serological titre in this group indicates a favourable response to therapy On the basis of previous experience with much larger series of patients treated for secondary syphilis with doses of penicillin varying from 2,400,000 to 9,000,000 units given over periods of 8 to 15 days, we should expect continued seropositivity with low titres in from 12% to 28% of patients followed for 1 to 3 years Most of these patients finally become seronegative without re treatment, and we have abundant evidence that re treating them will not hasten the reversal of the positive tests to negative In the past, it had been our policy to re treat patients with Kahn titres of 16 or more, one or more years after treatment It is questionable whether such cases are actually treatment failures because experience has proved that re treatment with large amounts of penicillin and in some cases with arsenic and heavy metal therapy, has had little or no effect on the serological response The figures given above show that 4 such patients in the group with original infections of secondary syphilis were re-treated, so far without producing seronegativity in any In our opinion, seroresistance in such patients is not proof of persistent infection, and therefore they are not necessarily treatment failures

Although the numbers of patients who were re treated with 1,200,000 or 2,400,000 units of PAM because of relapse or reinfection after previous therapy for early syphilis are only 12 and 5 respectively, the results are comparable with those found in large series of patients re treated with much greater doses of penicillin given over periods of 8 to 15 days It is somewhat surprising and gratifying to find that 8 of the 12 patients re-treated with a single injection of 1,200,000 units of PAM have become seronegative, an additional patient was re treated again because of a new chancre

From our studies it is evident that a single injection of 1,200,000 units of PAM may be a satisfactory procedure for seronegative and seropositive primary syphilis If a single treatment for secondary syphilis is used, it seems advisable to give 2,400,000 units of PAM

Bejel

The authors were not responsible for the treatment of bejel cases, but, for the sake of completeness, a preliminary report of the work carried out by Dr E H Hudson[c] is included in this paper

Under the sponsorship of WHO, UNICEF, and the Government of Iraq a project was initiated in the autumn of 1950 to make a mass attack upon treponematosis in Iraq and to establish conditions for its control During the preliminary investigations by Dr Hudson, approximately 2,500 individuals were treated with PAM A minimal dosage of 1,200,000 units was adopted because this amount had been found effective in non venereal treponematoses elsewhere Infants would be given 600,000 units, but all women and children would receive the full dose of 1,200 000 units, and some men would be given 1,800,000 units These doses would be administered in two injections, and theoretically would maintain an effective level in the blood for 4 days Dr Hudson did not hesitate to make a similar injection the next day if the patient appeared, or to repeat the injection 3, 6, or even 10 days later if the opportunity presented itself In general, there appeared to be no difference in the clinical results between those who had received a single injection and those who had received more than one Dr Hudson believes that the single injection will be sufficient in a mass treatment programme When patients were re-examined 3 months after therapy, it was observed that all open lesions had healed, irrespective of the dosage of penicillin In a small series of sera obtained from patients three months after therapy, there was no appreciable change in the serological pattern or reduction in serological titre Dr Hudson is of the opinion that bejel can be controlled and virtually eliminated within a few years by a programme in which small medical teams use penicillin alone and circulate along definite routes, which are traversed again at annual intervals This programme would be accelerated by any activity aimed at improvement of village hygiene and welfare

Conclusions

Clinical studies based on extensive penicillin assay investigations were initiated to determine the efficacy of this antibiotic in the therapy of the treponematoses Treatment schedules were selected on the basis of the type

[c] Based on a personal communication from Dr Hudson

in serological titre, the most favourable were in Group C where the corresponding figures were 94 4% and 5 6% respectively. Clinical results were rapid, most lesions healing completely within 3 months

For the studies on pinta, microcrystalline procaine penicillin G gelled in oil and aluminium monostearate (PAM) was administered to 665 Mexican patients Four schedules of therapy were used, the total dosage varying from 1,200,000 to 4,800,000 units 73 8% of those treated with a single injection of 1,200,000 units and followed up for a year, and 72 9% of those receiving the same total dosage in 4 weekly injections of 300,000 units showed serological cure or improvement. The serological and clinical response was slower than in patients with syphilis or yaws, but that is probably a reflection of the duration of the disease All patients with primary lesions, however, were clinically cured and only 9 8% of those with late pinta failed to show any appreciable clinical response

The efficacy of a single injection of PAM for early syphilis has been studied in patients at Bellevue Hospital, New York They have received either 1,200 000 or 2,400,000 units and have been followed for from 9 to 40 months All patients with seronegative or seropositive primary syphilis had attained or maintained seronegativity when last examined, irrespective of whether they had received the greater or the lesser dose Of 63 patients treated with 1,200,000 units for secondary syphilis, 11 1% had to be re-treated for relapse or reinfection, against 4 3% of the 23 patients treated with 2,400,000 units The authors conclude that a single injection of 1,200,000 units of PAM may be satis

résultats les moins satisfaisants 90,7% de ceux qui ont été soumis à une surveillance post-thérapeutique se sont révélés sérologiquement guéris ou améliorés, et 9,2% avaient fait une rechute ou n'accusaient aucune diminution du titre sérologique Les meilleurs résultats ont été enregistrés dans le groupe C, pour lequel les chiffres ont été, respectivement, 94,4% et 5 6%. L'amélioration clinique a été rapide, la plupart des lésions ayant complètement disparu après 3 mois

Dans les études sur le traitement de la pinta, de la pénicilline G procaïnée microcristalline sous forme de gel dans l huile et le monostéarate d'aluminium (PAM) a été administrée à 665 Mexicains Quatre schémas de traitement ont été appliqués, dans lesquels les doses totales ont varié de *1 200 000 à 4 800 000 unités de PAM* Une année après le traitement, 73,8% des sujets qui avaient reçu une injection unique de 1 200 000 unités de PAM et 72,9% de ceux à qui une dose identique avait été administrée à raison de 4 injections hebdomadaires de 300 000 unités chacune étaient sérologiquement guéris ou améliorés L'abaissement du titre sérologique et l'amélioration clinique se sont manifestés moins vite que dans le cas de syphilitiques ou de pianiques, ce qui peut s'expliquer probablement par la durée de la maladie De toute façon, tous les malades atteints de lésions *primaires* ont été cliniquement guéris et 9,8% seulement de ceux qui souffraient de pinta tardive n'ont pas présenté d'amélioration clinique nette

Les auteurs ont cherché à déterminer, sur des malades du Bellevue Hospital, à New-York, l'efficacité d'une injection unique de PAM dans le traitement de la syphilis récente. Ils ont administré à des malades soit 1 200 000, soit 2 400 000 unités de PAM, puis les ont maintenus en *observation pendant des périodes allant* de 9 à 40 mois Quelle qu'ait été la dose administrée, tous les sujets atteints de syphilis primaire, séronégatifs ou séropositifs, étaient restés ou devenus séronégatifs lors du dernier examen Sur 63 malades atteints de syphilis secondaire et traités avec 1 200 000 unités, 11,1% ont dû subir un nouveau traitement par suite d'une rechute ou d'une réinfection, alors que

factory for primary syphil s but that 2 400 000 units are required if the single injection technique is used for secondary manifestations

4 3% seulement des 23 malades à qui l on avait injecte 2 400 000 unites ont dû être traités une seconde fois Les auteurs concluent qu une dose unique de 1 200 000 unités de PAM peut etre suffisante pour les cas de syphilis primaire mais que 2 400 000 unités sont necessaires — si l on appl que la méthode de l injection unique — pour le traitement de la syphilis secondaire

The authors briefly consider a mass treatment campa gn against bejel carried out since 1950 in Iraq under the sponsor sh p of the Iraqi Government WHO and UNICEF Some 2 500 patients were treated with PAM the minimal dose being 1 200 000 units or in the case of infants, 600 000 units At follow up examinations 3 months after treatment it was observed that all open lesions had healed regardless of the dosage used there was however little change in the serological titres

Les auteurs examinent ensuite brièvement les données relat ves à une campagne de traitement systématique du bejel entre prise en Irak depuis 1950 sous les auspices du gouvernement de ce pays de l OMS et du FISE Quelque 2 500 malades ont éte traites par le PAM la dose minimum administree étant de 1 200 000 unités (600 000 unités pour les nourrissons) Les examens de contrôle effectués 3 mois après le traitement ont révéle que toutes les lésions ouvertes etaient cicatrisées quelle qu ait éte la dose injectée Le titre sérologique en revanche n avait pas notablement changé

In their conclusions the authors state that they have found repository penicillin *to give consistently good clin cal results* and they feel that adequate treatment in a single injection is possible without fear of untoward reactions This is of great value in those countries where the major ty of patients liv ng in rural areas must be treated with a single injection They con s der that it is now possible to control the infectious stage of yaws and ultimately to eradicate the disease in a relatively short period of time

En conclusion les auteurs indiquent qu ils ont constamment obtenu de bons *résultats cliniques avec la pénicilline retard* et qu il est poss ble d administrer ce produit en une seule injection sans que l on ait à craindre de réactions fâcheuses C est là un fait très important pour les pays où la majorité des malades vivent dans des régions rurales et doivent être traités par une seule injection Les auteurs estiment que l on peut maintenant combattre efficacement le p an à sa phase contagieuse et parvenir finalement à supprimer cette maladie en un laps de temps relativement court

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factory for primary syph lis, but that 2 400 000 units are required if the single-injection technique is used for secondary manifestations

The authors briefly cons der a mass-treatment campaign against bejel carried out s nce 1950 in Iraq under the sponsorship of the Iraqi Government WHO and UNICEF Some 2 500 patients were treated with PAM the minimal dose being 1 200 000 units or in the case of infants 600 000 units At follow up examinations 3 months after treatment it was observed that all open lesions had healed regardless of the dosage used there was however l ttle change in the serolog cal titres

In their conclus ons the authors state that they have found repository penicillin to give consistently good clinical results and they feel that adequate treatment in a single injection is possible without fear of untoward reactions This is of great value in those countries where the majority of patients l ving in rural areas must be treated with a single injection They consider that it is now possible to control the infectious stage of yaws and ultimately to erad cate the disease in a relatively short period of time

4 3% seulement des 23 malades à qui l on avait injecté 2 400 000 unites, ont dû être traités une seconde fois Les auteurs concluent qu une dose unique de 1 200 000 unités de PAM peut être suffisante pour les cas de syphilis primaire mais que 2 400 000 unités sont nécessaires — si l on applique la méthode de l injection unique — pour le traitement de la syphilis secondaire

Les auteurs examinent ensuite brièvement les donnees relatives à une campagne de traitement systématique du béjel entreprise en Irak depuis 1950 sous les auspices du gouvernement de ce pays de l OMS et du FISE. Quelque 2 500 malades ont été traités par le PAM la dose minimum administrée étant de 1 200 000 unités (600 000 unites pour les nourrissons) Les examens de contrôle effectués 3 mois après le traitement ont révélé que toutes les lésions ouvertes éta ent cicatrisées quelle qu ait été la dose injectée Le titre sérologique en revanche n avait pas notablement changé

En conclusion les auteurs indiquent qu ils ont constamment obtenu de bons résultats cliniques avec la pénicilline retard et qu il est possible d administrer ce produ t en une seule injection sans que l on ait à craindre de réactions fâcheuses C est là un fait très important pour les pays où la majorité des malades vivent dans des rég ons rurales et doivent être traites par une seule injection Les auteurs estiment que l on peut maintenant combattre efficacement le pian à sa phase contagieuse et parvenir finalement à supprimer cette maladie en un laps de temps relativement court

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ANTIBIOTICS OTHER THAN PENICILLIN IN THE TREATMENT OF YAWS

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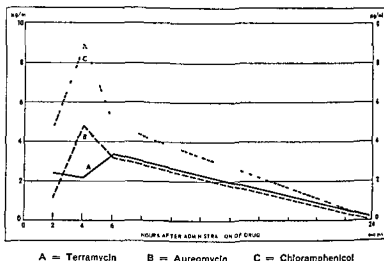
Since Findlay in 1943 [18] first used a crude preparation of penicillin to treat framboesia in West Africa, the reputation of the use of penicillin in the treatment of this disease has increased with the passing of the years [7, 11, 14, 18, 19, 25, 28, 37]

Since 1947 three new antibiotics have been isolated from strains of *Streptomyces* species isolated in widely separate places They are chloramphenicol, described by Ehrlich et al,[13] aureomycin, described by Ehrlich et al [13] and by Duggar,[10] and, more recently, terramycin described by Finlay et al [15] All three antibiotics are characterized by a wide antimicrobial activity against many bacteria as well as against certain rickettsiae, large viruses, and treponemes

Although some difference in activity may be demonstrated both in vitro and in vivo by these three antibiotics, they have much in common All three have a low degree of toxicity to both animals and man, and all three at proper dosage levels are equally effective in certain diseases of man All three drugs are crystalline, efficacious when taken by mouth, rapidly absorbed, and excreted in relatively large quantities in the urine From the clinical point of view, these drugs differ from each other in that one is more effective than another against certain diseases, for example, chloramphenicol against typhoid fever, terramycin against certain rickettsioses, and aureomycin against certain staphylococcus infections

In Jamaica, the dosage aimed at was approximately 25 mg of antibiotic per kg of body-weight per day This, in fact, implied a dosage of 1 g per day for 14 days for the adult The subsequent description, taken from the publication by Welch,[36] of absorption and excretion will be in relation to the effects of this 1-g dose on an adult person Fig 1 shows the average serum levels following one 1-g oral dose of terramycin, aureomycin, and chloramphenicol It will be noticed that significant blood concentrations are present for at least 6 to 8 hours after administration of all the drugs,

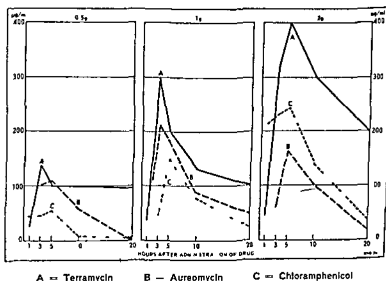
FIG 1 AVERAGE SERUM LEVELS FOLLOWING 1 g DOSE OF TERRAMYCIN AUREOMYCIN, AND CHLORAMPHENICOL



A = Terramycin B = Aureomycin C = Chloramphenicol

and there is, up to about 24 hours, still some concentration in the blood. It should also be noted that chloramphenicol and aureomycin seem to be more rapidly absorbed

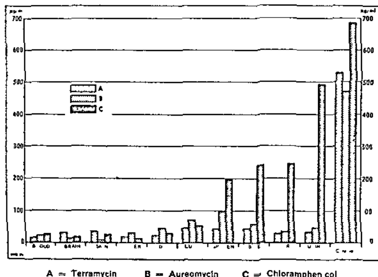
FIG 2 AVERAGE CONCENTRATIONS OF TERRAMYCIN AUREOMYCIN AND CHLORAMPHENICOL IN URINE AFTER SINGLE ORAL DOSES



A = Terramycin B — Aureomycin C = Chloramphenicol

Fig 2 shows the urinary concentration of terramycin, aureomycin, and chloramphenicol after a single oral dose of 1 g and it will be noticed that the urine still contains a certain quantity after a 1-g dose at the end of 20 hours This implies that there is still a concentration within the body after that time Fig 3 shows the distribution of the same drugs in rabbit tissues 4 hours after an oral dosage with half a gram of each drug These experiments therefore show that the absorption is rapid, that there is still a certain amount of drug being excreted at the end of 20 to 24 hours, and that the drug does enter the skin tissues

FIG 3 DISTRIBUTION OF AUREOMYCIN TERRAMYCIN AND CHLORAMPHENICOL IN RABBIT TISSUES FOUR HOURS AFTER ORAL ADMINISTRATION OF 0 5 g PER kg BODY WEIGHT



A = Terramycin B = Aureomycin C = Chloramphen col

I am unaware of any experiments which would indicate the therapeutic levels desirable in either blood or tissues for these antibiotics against treponemes such as have been carried out by Eagle et al [11] on penicillin

One encouraging feature of these antibiotics is that their pattern of resistance is of the penicillin type and not of the streptomycin type [5] The cause of bacterial resistance to antibiotics appears to be the occurrence of spontaneous mutants present among a large population of cells

There are two known types of bacterial resistance to antibiotics The penicillin type requires a series of multiple genetic changes for development of complete resistance Complete resistance is never attained by a single mutation and requires the interaction of a series of consecutive mutations,

vould render all the infectious cases non infectious, and they established wo schedules · 10 g in five days and 10 g in three days Both these chedules appeared to give equally good results on short term follow-ups if about three months They have treated about 100 cases with the two chedules and have had only two relapses.

In Jamaica, my colleagues and I [19, 20] treated 41 patients with 1, 2, 3, or 4 0 25 g capsules daily for 14 days, occasionally, infants were treated with a chocolate-tasting powder-form Our results may be summarized as follows

	After 1 month (%)	*After 9-12 months* (%)
Follow up	81 5	50 5
Cure	70 0	82 5
Improvement	28 5	—
Failure	—	10 0
Relapse	1 5	5 0
Reinfection	—	2 5
Delinquency	18 5	49 5

As regards the clinical course following treatment, it was found that the healing was generally much slower than in the case of penicillin This has been observed by others,[1] although Loughlin et al [24] found the contrary to be true The initial lesions and the early framboesides cleared up very quickly, but the later ulcerative and lupoid framboesides sometimes took as long as from six weeks to six months to heal completely The non-ulcerative plantar framboesides became painless within the first week or so, but because of the hyperkeratosis they took months to show any marked clinical improvement Several cases showing large ulcerative framboesides were treated beneficially by the topical application of aureomycin powder or aureomycin dressings as well as by oral administration of the drug Similar successful results have been reported by Loughlin et al [24]

One interesting finding in Jamaica, which was observed in ten cases in which initial framboesial ulcers or later ulcerative framboesides were present, was that between the first and second week the healing crusts became chalky-white in colour Subsequent healing seemed to be quite normal *No signs of toxicity other than occasional nausea were encountered*

As an example of a case in which treatment failed, the following can be given

Case A37 female aged two years , duration of disease, four months, papillomatous framboesides present, serological titre, 1 024 Kahn units, dosage 0 25 g daily for 14 days After four weeks the titre had fallen to 256 units with only slight clinical improvement After nine months the patient was no better, and the titre remained at 256 Comment there was great doubt whether the total dosage of drug had been administered

Several cases showed reinfection after cure

Case A50 female aged seven years , duration of disease, four months , plantar and palmar ulcerative framboesides present , serological titre 16 Kahn units , dosage, 0.5 g daily for 14 days Two weeks after treatment she showed slight improvement , four

weeks after treatment the improvement continued, with a titre of 8 units After months she was seronegative and completely cured, but four weeks later she was by a dog and developed an initial lesion at the site of the bite

Case A34 male aged three and a half years, duration of disease, 11 months, m framboesides present, and pains in the bones of the hands and legs, serological 256 Kahn units, dosage, 0 5 g daily for 14 days After two weeks the serologica was 138 units, and the patient was clinically cured, after four weeks the titre had dr to 32 units After nine months a history was given that the child had been free infection until just a month before when he had contracted an initial lesion On exa tion he was found to have an initial lesion and macular framboesides, his serol titre at that stage was 128 Kahn units

Chloramphenicol

Chloramphenicol has been shown to have some activity agains treponeme of syphilis [29, 31] Table II gives data on the use by several au of chloramphenicol in the treatment of yaws

Ampofo & Findlay [3] in Africa treated three patients and, af six-week follow-up, found a clinical cure in all cases Payne et al,[27] t various schedules of dosage on ambulatory and hospital patients, tr 62 cases with success, but there was only a short follow up of six w

TABLE II TREATMENT OF YAWS WITH CHLORAMPHENICOL

Author	Number of cases	Dosage	Duration of follow up	Toxicity	Resu
Ampofo & Findlay [3] (West Africa)	3	1 5 g 2 g or 3 g daily × 7	6 weeks	nil	clinical c
Payne et al [27] (South America)	62	total of 3 g 16 g on various schedules	6 weeks	nil	clinical and i provem in mar cases
Hill [18] (Jamaica)	99	25 mg per kg of body weight daily × 14	9 12 months	occasional nausea and vomiting thirst	clinical c 79 %

In Jamaica, my colleagues and I [18] have treated 99 cases, using a d of 25 mg per kg of body weight per day for 14 days, and the follo has been 9 to 12 months At the end of one month, the delinquency was 15%, and, at the end of 9 to 12 months, 17% The area involved much easier to administer from the point of view of the patients than th which we tested the aureomycin, and we had a bigger staff of nurses sanitary inspectors The delinquency rate was therefore much lower in the aureomycin trial Occasionally, patients had felt nauseated taking the drug, but otherwise no symptoms of toxicity were reported results were as follows

	After 1 month (%)	After 9-12 months (%)
Follow-up	85 0	83 0
Cure	65 0	79 0
Improvement	35 0	—
Failure	—	3 5
Relapse	—	13 0
Reinfection	—	4 5
Delinquency	15 0	17 0

The following may be cited as typical cases of failure

Case A5 male aged seven years , duration of disease, unknown , circinate papillomatous and papular framboesides present , serological titre, 256 Kahn units , dosage, 0 5 g daily for 14 days In two weeks he had improved clinically, but there was no change in the titre , in four weeks all lesions had disappeared, but the titre was still the same. After nine months the titre had dropped to 16 units, but he had developed bilateral tibial osteitis

Case C77 . male aged ten years , duration of disease, six months , non ulcerative plantar framboeside present , serological titre, 128 Kahn units , dosage, four capsules (1 g) daily for 14 days In two weeks he had improved, with a titre of 64 units In four weeks the titre was unchanged , after nine months the patient s condition was much the same, with a positive serological reaction

Several cases showed relapse, the following may be considered as typical

Case C7 female aged 12 years , disease of long duration , papillomatous framboesides present , serological titre, 32 Kahn units , dosage, 0 5 g daily for 14 days After two weeks she had improved but her titre was still 32 , after four weeks the improvement had continued and the titre had fallen to 16 , after six weeks all lesions had disappeared and the titre was 8 Nine months after treatment she relapsed, with a titre of 256 Kahn units and ulcerative and lupoid framboesides of the legs

Cases of reinfection also occurred :

Case C69 female aged nine years , duration of disease, one and a half months , circinate framboesides and non ulcerative plantar lesions present , serological titre, 64 Kahn units , dosage, 0 25 g daily for 14 days In two weeks she had improved, and her titre was 32 , after four weeks she was clinically cured but with no change in titre Another member of her family contracted yaws, and the patient was reinfected Nine months after treatment, she had ulcerative plantar framboesides and her titre was 80 Kahn units

In general, the healing of the framboesial lesions was similar to that following treatment with aureomycin

Terramycin

Terramycin has been shown to act as a curative agent in human syphilis by Hendricks et al [17] and Schoch & Alexander [34] It has also been shown

weeks after treatment the improvement continued, with a titre of 8 units After nine months she was seronegative and completely cured, but four weeks later she was bitten by a dog and developed an initial lesion at the site of the bite

Case A34 male aged three and a half years , duration of disease 11 months , macular framboesides present, and pains in the bones of the hands and legs, serological titre 256 Kahn units, dosage, 0 5 g daily for 14 days After two weeks the serological titre was 138 units, and the patient was clinically cured, after four weeks the titre had dropped to 32 units After nine months a history was given that the child had been free from infection until just a month before when he had contracted an initial lesion On examination he was found to have an initial lesion and macular framboesides, his serological titre at that stage was 128 Kahn units

Chloramphenicol

Chloramphenicol has been shown to have some activity against the treponeme of syphilis [29, 31] Table II gives data on the use by several authors of chloramphenicol in the treatment of yaws

Ampofo & Findlay [3] in Africa treated three patients and, after a six week follow-up, found a clinical cure in all cases Payne et al ,[27] trying various schedules of dosage on ambulatory and hospital patients, treated 62 cases with success, but there was only a short follow up of six weeks

TABLE II TREATMENT OF YAWS WITH CHLORAMPHENICOL

Author	Number of cases	Dosage	Duration of follow up	Toxicity	Result
Ampofo & Findlay [1] (West Africa)	3	1 5 g 2 g or 3 g daily × 7	6 weeks	nil	clinical cure
Payne et al [27] (South America)	62	total of 3 g 16 g on various schedules	6 weeks	n	clinical cure and improvement in many cases
Hill [18] (Jamaica)	99	25 mg per kg of body weight daily × 14	9 12 months	occasional nausea and vomiting thirst	clinical cure 79 %

In Jamaica, my colleagues and I [18] have treated 99 cases, using a dosage of 25 mg per kg of body-weight per day for 14 days, and the follow up has been 9 to 12 months At the end of one month, the delinquency rate was 15%, and, at the end of 9 to 12 months, 17% The area involved was much easier to administer from the point of view of the patients than that in which we tested the aureomycin, and we had a bigger staff of nurses and sanitary inspectors The delinquency rate was therefore much lower than in the aureomycin trial Occasionally, patients had felt nauseated after taking the drug, but otherwise no symptoms of toxicity were reported The results were as follows

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Cure	65 0	79 0
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Case C69 female aged nine years duration of disease one and a half months circinate framboesides and non ulcerative plantar lesions present serological titre 64 Kahn units dosage 0 25 g da ly for 14 days In two weeks she had improved and her titre was 32 after four weeks she was clinically cured but with no change in titre Another member of her family contracted yaws and the patient was reinfected Nine months after treatment she had ulcerative plantar framboesides and her titre was 80 Kahn units

In general the healing of the framboesial lesions was similar to that following treatment with aureomycin

Terramycin

Terramycin has been shown to act as a curative agent in human syphilis by Hendricks et al [17] and Schoch & Alexander [34] It has also been shown

experimentally by Levaditi & Vaisman[21] to have an anti treponemal action in syphilitic rabbits and mice The authors conclude that this drug comes close to penicillin in its curative effects, that is to say, it brings about rapid disappearance of the treponemes, cicatrization of the lesions, and sterilization of blood and lymph nodes They are also of the opinion that aureomycin and chloramphenicol are not as virucidal in their action

TABLE III TREATMENT OF YAWS WITH TERRAMYCIN

Author	Number of cases	Dosage	Duration of follow up	Toxicity	Result
Guimarães & *Travassos* (*Brazil*)	4	total of 5 g 15 g *over 10 days*	16 days	—	clinical cure
Loughlin & *Joseph* (Haiti)	150	(a) 7 g in 3 days (b) 10 g in 5 days	approximately 3 months	nausea vomiting and anorexia in 5 cases	clinical cure
Ampofo & Findlay (West Africa)	6	1 5 g 2 g daily × 7	3 months	nil	clinical cure
Hill (Jamaica)	8	25 mg per kg of body weight daily × 14	3 months	intense thirst	clinical cure in 5 cases

Table III gives data on the use of terramycin by several authors in the treatment of yaws It will be seen that in Brazil Guimarães & Travassos[16] successfully used terramycin in four cases with total doses of 5 g 15 g over a period of ten days, *active lesions cleared in 6 16 days Ampofo & Findlay* [4] working in West Africa treated six patients with secondary yaws with doses of from 10 5 g to 14 g over a period of seven days The treponemes disappeared from the lesions in 24-36 hours and there was healing within four days A three month follow up showed no recurrence

The most extensive trial has been that of Loughlin & Joseph[23] in Haiti who have treated 150 cases of yaws The patients consisted of adults and children presenting primary lesions secondary lesions and tertiary *manifestations all seropositive They were given the following oral* treatment 7 g in 3 days (3 g on the first day 2 g on the second, and 2 g on the third) or 2 g daily for a period of five days (total dosage 10 g) Their results were as follows rapid disappearance *of the treponemes from the*

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Primary lesions were often almost completely healed in four days and the deeply ulcerative initial lesions within three weeks Secondary lesions

were healed in 5 14 days and ulcerative plantar lesions in 11-21 days Tertiary lesions responded well, albeit more slowly, and, with the addition of the local application of terramycin powder to large ulcerative and secondarily infected lesions, the rehabilitation of a number of patients, who might otherwise have been considered as hopeless cripples, was accomplished Nausea, vomiting, and anorexia were noted in five children under eight years of age

The authors are of the opinion that terramycin is much more efficacious than procaine penicillin in dosages of 600,000 to 1,200 000 units, even in children, and that it has a superior curative action not only in the treatment of primary and secondary yaws, but also in the treatment of tertiary yaws, especially when used in conjunction with topical therapy

In Jamaica we have studied the effects of terramycin in eight cases only, over a period of three months It will be seen from table IV that five cases out of the eight were cured by the end of three months The other three cases, which had non-ulcerative plantar lesions, were much improved at the end of three months, they had all very quickly lost their pain, were able to walk, attend school, or go back to work All patients complained of thirst

Serology

The following tabulation shows the serological findings, following treatment with aureomycin and chloramphenicol, using the Kahn quantitative test, the pattern is almost the same for both drugs

	Aureomycin (41 cases) (%)	*Chloramphenicol (81 cases) (%)*
Cases with fall in titre	78	80
Cases with no fall in titre	18	10
Seronegative cases remaining seronegative	4	10
Cases becoming seronegative	25	29
Cases with rise in titre two weeks after treatment with subsequent fall	12	12

The titre of the reagin in framboesia in general tends to rise much more slowly than that in syphilis after initial infection, likewise, after treatment, the fall in titre in the framboesial patient is much slower Thus, Chambers [5] reports that, out of 554 cases of framboesia treated variously with arsenicals and bismuth compounds, only about 54% had a reversal of the serological findings after 18 months, and Saunders et al [32] found that, after two and a half years, of 1,265 cases treated with neoarsphenamine, only about 60% had become seronegative, and that, out of 535 cases treated with bismuth salicylate, only about 72% had become seronegative

[illegible]NT OF YAWS WITH TERRAMYCIN IN JAMAICA 1951-2

[illegible]	[illegible]	[illegible]	Type of lesion	Dosage	Time taken for cure	Clinical condition after 3 months
[illegible]	[illegible]	[illegible] years	non ulcerative plantar framboeside (had been cured with chloramphenicol but relapsed)	0 25 g × 14	—	lesions still present but tenderness gone
[illegible]	[illegible]	2 months	initial lesion	0 5 g × 14	2 months	cured
[illegible]	[illegible]	3 months	initial lesion and papillomatous framboeside	0 5 g × 14	?	cured
T4	35	?	non ulcerative plantar framboeside	1 g × 14	—	lesions still present but tenderness gone
T5	7	6 months	non ulcerative plantar framboeside	0 5 g × 14	—	lesions still present but tenderness gone
T6	3½	1 year	initial lesion and macular framboesides and non ulcerative plantar framboeside	0 25 g × 14	At 1 month all cured except plantar lesion	cured
T7	10½	3 years	ulcerative plantar framboeside	0 5 g × 14	—	cured
T8	9	2 months	Initial lesion and macular and papillomatous framboesides	0 5 g × 14	14 days	cured

Hill et al [19] found very few serological reversals to negativity in their series of cases after treatment with repository penicillin, and they quote similar findings by other authors

In the present study, although a decrease in the titre of the reagin was to be expected one year after treatment, it is significant that of the originally seropositive cases, 78% of those treated with aureomycin and 80% of those treated with chloramphenicol should have had a remarkable drop in titre almost approaching seronegativity, and that 25% and 29% respectively, of the total cases should actually have become seronegative

Another point worthy of note is that 12% of all cases showed a temporary rise in titre with the serological test two weeks after treatment This finding is [illegible]n in syphilis and is probably due to an extra stimulation of [illegible]ion of reagin during an active phase of the disease [35] The [illegible] cases under study had a duration of infection of 1 to 12 m[illegible] therefore were in the early stages of the disease

Discussion

In these trials there has been little sign of toxicity with these drugs other than occasional nausea As regards ease of administration, it would seem superficially that oral therapy is ideal, and, certainly from the point of view of pain, the patients much prefer not to have an injection Unfortunately, it is found in practice that the swallowing of the capsules by children is a very difficult procedure, the giving of capsules every day for 14 days has proved most difficult from both an administrative and a supervisory point of view However, aureomycin may be given in chocolate-tasting powder form, and chloramphenicol as a palatable liquid palmitate, which have proved of benefit

The team engaged in the recent trial in Jamaica made a special effort to see that the patients received their dosage of the drugs every day In an ordinary mass treatment campaign, such detailed supervision would be absolutely impracticable Capsules for treatment must be given under supervision The people suffering from framboesia are of such a low educational standard that they cannot be trusted to take the capsules home with them and to take them regularly as instructed Supervision of the taking of the capsules requires one of two things either the patient must come in daily for a certain period to a central point where a supervisor such as a doctor, nurse, or sanitary inspector can give out the capsules, or else the supervisor must visit the homes of the patients On a large scale trial, both these are impracticable in the country, because the villages may be almost inaccessible or far from the medical centres

As a result of our trials in Jamaica, involving the treatment of about 200 cases by oral administration of aureomycin, chloramphenicol, and terramycin, we have come to the conclusion that the ideal treatment is a course of two intramuscular injections separated by an interval of a few days

The price of the oral antibiotics is still very high, and the cost of treatment varies 30-60 shillings ($4 2 $8 4) depending on the weight of the patient

The arsenical and bismuth preparations, penicillin aureomycin, chloramphenicol, and terramycin all appear to be equally efficacious in the treatment of framboesia, although various authors claim that some are better than others The arsenical and bismuth preparations are not without their toxic manifestations, whereas the antibiotics are relatively non toxic

For ease of administration and supervision in mass treatment, it is believed that the "two-shot" treatment of penicillin far surpasses the giving of arsenic, bismuth, or the oral antibiotics, aureomycin, chloramphenicol, and terramycin This may be summarized in tabular form as follows

	Ideal treatment	Arsenic and bismuth	Penicillin	Aureomycin, chloramphenico and terramycin
Efficacy	+	+	+	+
Toxicity	0	+	0	0
Ease of administration	+	0	+	+
Ease of supervision	+	0	+	0
Low cost	+	+	+	0

If it were possible to produce repository antibiotics other than penicillin, then the claims of these antibiotics for use in the treatment of yaws would be much stronger

However, it behoves us not to be too enthusiastic at this stage, and we must be wary of our claims for the antibiotics; it is salutary to read an extract from a paper given by Dr. Gideon of Jamaica to the West Indian Medical Conference in 1921 He said · " In Jamaica an intensive campaign has been and is being waged against this loathsome disease, and the almost miraculous cure of the condition by one or two injections of the Salvarsan preparations has, I fear, given us a false sense of security, for, notwithstanding the undoubted lesser incidence of the disease consequent on the active war being waged against it, one finds that many cases of reinfection occur after apparent cure has been effected".

ACKNOWLEDGEMENTS

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Fig 1 2, and 3 are reproduced by kind permission of the editors of the *Annals of t New York Academy of Sciences*

SUMMARY

In a brief introduction, it is pointed out that three antibiotics have been isolated since 1947 chloramphenicol, aureomycin, and *terramycin Although certain differ-*ences exist between them, they have many characteristics in common all three have a low degree of toxicity, and all three at proper dosage levels are equally effective

RÉSUMÉ

Dans une brève introduction, l'aute signale que trois nouveaux antibiotiqu ont été isolés depuis 1947 . le chlorar phénicol, l'auréomycine et la terramycin Malgré certaines différences, ces produ présentent de nombreux caractères con muns , tous trois n'ont qu'une faib toxicité et tous trois sont, à dose appr

in certain diseases of man. Clinically, the difference is that one is more effective than another against a particular disease

The pattern of resistance to these antibiotics is of the penicillin type rather than of the streptomycin type They are therefore unlikely to produce a resistant type of organism in the human body

For the author's own experiments on yaws in Jamaica, with oral administration of all three drugs, an approximate dosage estimate was made of 25 mg per kg of body weight In practice, this worked out at four capsules (1 g) per day for 14 days for adults, two capsules (0 5 g) daily for 14 days for children of 5 10 years of age, and one capsule (0 25 g) daily for 14 days for children under 5 years.

The author then considers the use of each antibiotic separately A table shows the dosages used and results obtained with aureomycin by various authors in West Africa, Haiti, and Jamaica Clinical cures were obtained in the greater number of cases, but healing of lesions was generally slower than with penicillin. No symptoms of toxicity, other than occasional nausea and vomiting, were observed The author also gives a number of case histories of failures and reinfections

For chloramphenicol also, the dosages and the results obtained by authors in West Africa, South America, and Jamaica are tabulated. Occasional vomiting, nausea, and thirst were the only signs of toxicity noted Case histories are again given illustrating *failure, relapse, or reinfection.* The author notes that the healing of framboesial lesions was similar to that following treatment with aureomycin

priee, egalement efficaces pour le traitement de certaines maladies de l'homme Du point de vue clinique, les differences portent sur l efficacité plus ou moins grande de tel antibiotique par rapport aux autres pour combattre une maladie donnee

La résistance des bactéries à ces antibiotiques est comparable à celle qui a été observée avec la pénicilline plutôt qu'à celle que provoque l emploi de la streptomycine, il est donc très peu probable que ces antibiotiques déterminent l'apparition dans le corps humain d'un type de germes résistant à leur action.

Dans les expériences qu'il a effectuées à la Jamaïque sur des cas de pian, l'auteur a adopté une posologie d'environ 25 mg d'antibiotique par kg de poids du corps, les trois médicaments étant administrés par voie buccale En pratique, la dose a été de 4 capsules (1 g) par jour pendant 14 jours pour les adultes, de 2 capsules (0,5 g) par jour pendant 14 jours pour les enfants de 5 à 10 ans, et d'une capsule (0,25 g) par jour pendant 14 jours pour les enfants de moins de 5 ans

L'auteur examine ensuite séparement le mode d'emploi de chaque antibiotique Un tableau indique les doses d'auréomycine utilisées et les résultats obtenus par divers chercheurs en Afrique-Occidentale, à Haïti et à la Jamaïque. Le plus souvent, des guérisons cliniques ont été enregistrées, mais la cicatrisation des lésions a été en général plus lente qu'avec la pénicilline Abstraction faite de nausées et de vomissements occasionnels, on n'a observé aucun symptôme d'intoxication L'auteur décrit un certain nombre d observations d'échecs et de réinfections

Pour le chloramphénicol également, la posologie et les résultats obtenus par différents chercheurs en Afrique-Occidentale, en Amérique du Sud et à la Jamaïque sont présentés sous forme de tableau Les seuls effets toxiques constates ont été parfois *des vomissements des nausées et une* sensation de soif A cet égard encore, l auteur decrit un certain nombre d'observations d'echecs, de rechutes ou de réinfections. Il note que la cicatrisation des lesions pianiques s'est opérée comme dans le traitement à l'auréomycine.

As regards terramycin, other authors are cited to show that it is close to penicillin in its curative effects, causing rapid disappearance of treponemes, cicatrization of the lesions, and sterilization of blood and lymph nodes A table showing dosages and results with this drug in Brazil, Haiti, West Africa, and Jamaica again indicates clinical cure in most cases In a number of cases, the treponemes disappeared from primary lesions in 24-36 hours and there was healing within four days In Haiti out of 150 cases treated, vomiting nausea, and anorexia were noted in five, in Jamaica, all 8 patients treated complained of intense thirst

*It is shown that the patterns of the sero*logical results following treatment with aureomycin and chloramphenicol are very similar, of 41 cases in Jamaica treated with the former and 81 cases with the latter, 78% and 80%, *respectively*, showed a fall in titre almost approaching seronegativity, while 18% and 10%, respectively, showed no fall Of all 122 cases, 12% showed a rise in titre two weeks after treatment, with a subsequent decrease

In the final section, the author states that, while oral therapy would seem ideal for administration, children find it very difficult to swallow the capsules, and that it is difficult to supervise the taking of capsules daily for 14 days Close supervision was possible in Jamaica, but it required a special effort which would not

[illegible] The

ideal treatment and that, were it possible to produce aureomycin chloramphenicol, and terramycin in repository form, as has been done with penicillin, their claims

En ce qui concerne la terramycine, l auteur cite plusieurs autres chercheurs afin de montrer que les effets curatifs de cet antibiotique sont presque identiques à ceux de la pénicilline disparition rapide des tréponèmes, cicatrisation des lésions et stérilisation du sang et des ganglions lymphatiques Un tableau indique que la posologie et les resultats obtenus avec ce médicament au Brésil, à Haïti, en Afrique-Occidentale et à la Jamaïque, ici encore, on a constaté une guérison clinique dans la plupart des cas Dans un certain nombre de cas, on a observé la disparition des treponèmes dans les lésions primaires en 24 à 36 heures et la cicatrisation dans les quatre jours A Haïti sur 150 cas traités, on a enregistré cinq cas de vomissements, de nausées et d'anorexie, à la Jamaïque, les 8 malades traités se sont tous plaints d'une soif intense

L'auteur montre qu'à tout prendre les resultats serologiques obtenus par le trai tement à l'auréomycine, d'une part, au chloramphénicol, d autre part, presente une grande analogie à la Jamaïque s *41 cas traités à l auréomycine*, on a no une baisse du titre voisine de la ser negativité chez 78% des malades et l c n en a constaté aucune chez 18% d sujets, les chiffres correspondants enr gistrés après traitement de 81 cas par chloramphénicol ont été de 80% et (10% respectivement Sur l'ensemble d 122 cas, 12% ont présenté, deux semaine après le traitement, une élévation du titi suivie d'un flechissement

Dans la dernière partie de l articl l'auteur observe que si l'administratio par voie buccale pouvait sembler le mod idéal de traitement, les enfants éprouver toutefois de grandes difficultés à avale les capsules et qu'il est difficile de sur veiller pendant 14 jours l ingestion quot dienne du médicament ingéré sous cett forme A la Jamaïque, il a été possibl d'exercer une surveillance rigoureuse mai au prix d'efforts particuliers que l on n saurait pratiquement envisager lors d un campagne systématique Se fondant su sa propre expérience, l'auteur conclut qu deux injections administrées par voie intra musculaire à quelques jours d'intervall

to be used in treating yaws would be much stronger

constituent le traitement de choix s il était possible — ajoute-t il — de fabriquer des préparations retard d auréomycine de chloramphénicol et de terramycine comme on a pu le faire pour la pénicilline l emploi de ces antibiotiques dans le tra tement du pian serait beaucoup plus recommandé

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DISCUSSION : PART II

Chairman Dr R V RAJAM
Rapporteur Dr R R WILLCOX

Although the participants in the Symposium were aware of the effectiveness of orally administered antibiotics, they were generally agreed that the present day treatment of choice was with repository penicillin preparations given by intramuscular injection

Many speakers outlined their experience with the use of procaine penicillin G in oil with 2% aluminium monostearate (PAM), and all were agreed that this antibiotic was high in therapeutic efficacy, low in toxicity, relatively inexpensive, and capable of being administered in simplified schedules of therapy

Considerable debate took place on two points the most appropriate total dosage, and whether a single injection was sufficient These are points of great concern in large-scale campaigns where expediency in operation and the expense of penicillin are items of considerable moment

Dr Levitan had presented data suggesting that a single injection of 600,000 units of PAM was sufficient to cure a high proportion of patients, but he stressed the importance of preventing reinfections by the treatment of all contacts Other workers, notably those from areas where contacts had not been treated, favoured considerably higher total dosages (2,400,000 units), in view of the number of infectious cases they had encountered on resurveys

It was apparent that the question of the total PAM dosage was one that required a " calculated risk " compromise between maximal therapeutic efficacy and practical economy It appeared to be the consensus of opinion that a dosage of 600 000 units was too close to the level of inadequacy to be used generally, and that 2,400,000 units was an excessively high dosage to achieve the desired result Most of the participants agreed that 1,200,000 or 1,800,000 units of PAM represented the best compromise [a]

On the question whether the schedule of treatment should consist of one or of two injections, no comparable data were presented Those who had employed a single injection schedule expressed their full satisfaction with the results obtained and pointed out the great administrative advantage of a single injection schedule

[a] This is the dosage recommended by the WHO Expert Committee on Venereal Infections and Treponematoses for the treatment of adults with infectious lesions of yaws. The recommended dosage for children and infants is proportionately lower being determined by the weight or size of the patient.

The usefulness of quantitative serological tests as a guide to the effective ness of therapy was stressed by several participants It was generally considered impracticable to carry out routine serological tests on all patients, but in a treatment control area, the delineation of a population sample from which to assess the results of treatment in the mass campaign was considered to be highly desirable

DISCUSSION · PARTIE II

Président Dr R V RAJAM
Rapporteur Dr R R WILLCOX

Sans meconnaître l'efficacite de l'antibiotherapie par voie buccale les participants au Symposium ont estime qu'actuellement le traitement de choix consistait en injections intramusculaires de penicilline retard

Plusieurs d'entre eux exposerent les expériences faites au moyen de la penicilline G huileuse avec 2% de monostearate d'aluminium (PAM) De l'avis général cette preparation est tres efficace, peu toxique, relativement peu coûteuse et peut etre administree selon des schemas de traitement tres simples

Deux points furent longuement discutes Quelle est la quantité totale d antibiotique la plus appropriee au traitement ? Une injection unique assure t elle un traitement efficace ? Ces questions sont de la plus haute importance pour de vastes campagnes, dans lesquelles la rapidite d exe cution du traitement et le coût de la penicilline sont des élements deter minants

Selon les donnees presentees par le Dr Levitan, une seule injection de 600 000 unites de PAM parait suffisante au traitement d'une forte propor tion de malades Cet auteur a signale cependant la necessite de traiter t les contacts pour éviter les reinfections D autres chercheurs, en particu ceux qui venaient de regions ou les contacts n'avaient pas ete traités, preconise des doses totales plus elevees (2 400 000 unites) en raison nombre de cas infectieux rencontres au cours des enquetes de controle

Il ressort des discussions que le choix de la dose totale de PAM a adop resulte d'un compromis à « risque calcule » entre l efficacite thérapeuti maximum et les exigences economiques Il fut admis d une façon génér que la dose de 600 000 unites etait trop proche du niveau minimum d e cacite pour être couramment appliquee et que la dose de 2 400 000 uni etait excessive pour le but que l'on se proposait La plupart des participa furent d avis que 1 200 000 ou 1 800 000 unités representaient un co promis satisfaisant [a]

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[a] Cette quantité est celle qu a recommandée le Comité d experts des Maladies vénériennes et des T ponématoses pour le traitement des adultes atteints de lésions pianiques infectieuses La dose pour enfa et nourrissons est proportionnellement plus faible étant déterminée d après le poids ou la taille des suj

La question du choix du schéma de traitement — injection unique ou double injection — n'a pu être discutee, faute de donnees comparables Les participants qui avaient eu recours à l injection unique exprimèrent leur pleine satisfaction des resultats obtenus et soulignerent les avantages pratiques de ce schema de traitement

Plusieurs participants relevèrent l'interet que présentent les tests sero logiques quantitatifs comme indicateurs de l'efficacité du traitement Il parait le plus souvent impossible d effectuer des tests serologiques sur tous les malades, mais il est hautement souhaitable d'y proceder sur un groupe contrôle de la population d apres lequel le résultat du traitement systé matique au cours d une campagne pourra être évalué

Part III

EXTENT AND NATURE OF THE YAWS PROBLEM

Partie III

ETENDUE ET NATURE DU PROBLÈME DU PIAN

EXTENT AND NATURE OF THE YAWS PROBLEM IN AFRICA

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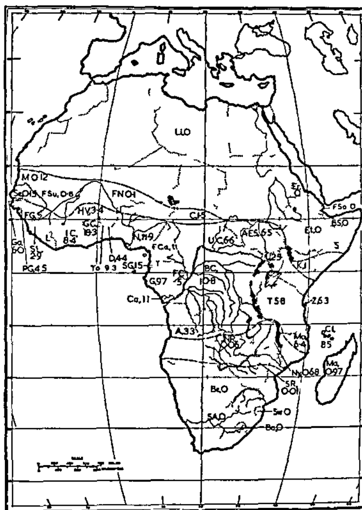
During the past ten years probably only about 25 papers have been published on yaws in Africa, many of these deal with one or two cases or with treatment of a few patients and their clinical observation for a few weeks only Since these were inadequate to provide the material necessary for the preparation of this paper, a questionnaire (see Annex 1, page 174) was prepared and translated into French, Portuguese, and Spanish Copies were distributed throughout Africa in August and September 1951, with a covering letter explaining that its purpose was to obtain data for the presentation of this paper to the Symposium A considerable number of replies have been received (see Annex 2, page 175) It was intended that this paper should be an up to-date summary of the present extent and nature of the yaws problem in Africa Alas, as Shakespeare hints, how far can expectation outrun achievement ! Unless otherwise indicated, the data given in this paper are based upon the replies to the questionnaire from the authorities listed in Annex 2

INCIDENCE OF YAWS

Geographical Incidence

The northern limit of yaws is probably fixed by the arid conditions of the Sahara. On the west coast, yaws occurs as far north as Senegal, being localized at Casamance on the coast except for a few foci along the River Senegal, but a few cases are reported each year from Mauritania, which lies to the north (20°N) Yaws is rare in the northern areas of French Sudan, French Niger, and Haute-Volta and occurs in south Chad only Proceeding eastwards, we find the incidence of yaws is low until 15°N (south of Lake Chad), or even 10°N (in the Anglo Egyptian Sudan), is approached At Ethiopia the boundary falls southward to Kenya, then proceeds eastwards at about 5°N to the coast (see fig 1, which is based upon table II)

FIG 1 MAP SHOWING YAWS INCIDENCE IN AFRICA 1948-50 IN PERCENT OF ALL CASES OF MORBIDITY



A	Angola	FN	French N ger	NR	Northern Rhode
A ES	Anglo-Egyptian Sudan (southern part)	FSo	French Somal land	Ny	Nyasaland
Ba	Basutoland	FSu	French Sudan	PG	Portuguese Guir
Be	Bechuanaland	G	Gabon	S	Somalia
BC	Belgian Congo	Ga	Gambia	Se	Senegal
BS	British Somal land	GC	Gold Coast	SG	Spanish Guinea
C	Chad	HV	Haute-Volta	SL	Sierra Leone
Ca	Cabinda	IC	Ivory Coast	SR	Southern Rhode
Cl	Comoro Islands	J	Iohannesburg	Sw	Swaz land
D	Dahomey	K	Kenya	T	Tanganyika
Er	Er trea	L	Liberia	To	Togo
Et	Ethiopia	Li	Libya	U	Uganda
FC	French Congo	M	Mauritania	UC	Ubangi Shari
FCa	French Cameroons	Ma	Madagascar	SA	Union of South
FG	French Guinea	Mo	Mozambiqu e	Z	Zanzibar
		N	N geria		

The southern boundary runs through Portuguese West Africa (Angola), above Bechuanaland, and through Southern Rhodesia, although the incidence of yaws in the south-eastern parts of these last two countries is complicated by the presence of both venereal syphilis and endemic syphilis (locally called "njovera") [24, 31, 32] The east coast is reached in Portuguese East Africa (Mozambique) The southern limit can thus be estimated to fall somewhere above 20°S, although high incidences of yaws would not be expected until farther north at about 15°S —to the north of the town of Mozambique, especially along the Zambesi River The incidence of yaws in Madagascar is low, while on the Comoro Islands it is high

There is a possible relationship between the occurrence of yaws, as shown in fig 1, and the average annual rainfall The full region of incidence of yaws is found in the area that receives more than *20* inches (*500* mm) of rain per annum and the area of higher incidence approximates to the area of 40-80 inches (1,000-2,000 mm) of rainfall [21] These equatorial areas have two rainy seasons each year The total yaws area lies within that part of Africa in which the average annual temperature does not fall below 68°F (20°C) Thus the yaws area is moist and warm The density of population ranges from 1 to 16 per square mile (0 3 6 per km^2) with areas where it reaches 128 per square mile (48 per km^2)

Statements that yaws was not endemic were received from British *Somaliland, Eritrea, Ethiopia, Libya, and the Portuguese islands of São* Tomé and Principe in the Gulf of Guinea Farther south, yaws was reported not to be endemic in Basutoland, Bechuanaland Swaziland, and the Union of South Africa No mention is made, in the annual reports of the Medical and Health Departments of the incidence of yaws in Mauritius in 1949 or in the Seychelles in 1946 Yaws is also not endemic in French Somaliland

Since the material available is rather scattered, it will be dealt with throughout this paper under the various headings of Annex 1, in alphabetical order of countries

Relation of Incidence to Climate, Geological Status, Altitude, Vegetation, and Population Density

Anglo-Egyptian Sudan

Yaws occurs practically only in the three southern provinces—Upper Nile, Equatoria, and Bahr el Ghazal—where 31,700 cases of yaws were treated in 1950 out of a population at risk of 2 1 million

Angola

Incidence is highest in the warm, humid forest districts such as Benguela, Congo and Cabinda Yaws is almost absent in the high plateau where the

climate is temperate such as in Bié, Huila, and Malange Where populations are dense, public and personal hygiene are poor and yaws is prevalent

Belgian Congo

Yaws is most prevalent in the following provinces Equator (Coquilhatville), East (Stanleyville), Kivu (Leopoldville), and in Ruanda Urundi In other areas it is infrequent or absent Yaws incidence appears to have no relation to climate though some doctors think that yaws is more prevalent in hot, moist forest areas Van Nitsen [25] states that yaws is most prevalent along the Congo River, then between 2°N and 1°S to 26°E, thence east to the Great Lakes, and south to 9°S

French Cameroons

Yaws is most frequent in coastal and forest areas

Gambia

Yaws is endemic in all areas, "but it is not apparently as prevalent as in the coastal and forest regions in other West African Territories" [a] There is a dry season from mid November to mid March, during the remainder of the year the climate resembles that of other parts of the West African coast The coastal temperature varies between 60°F and 100°F (16°C and 38°C) and in the interior the temperature varies between 60°F and 110°F (16°C and 43°C) The annual rainfall is extremely variable and ranges between 30 and 60 inches (760 and 1,520 mm)

Gold Coast

Yaws is endemic in the central, the north eastern, and the north western areas In the north eastern area (Dagomba), an incidence of 30 9% of 36 271 persons examined was found in 1948 In the north western areas, incidences range from 1 7% to 14 9% In general, the incidence is higher in drier areas and in the more primitive regions It was, however, observed that the incidence varied from village to village in an apparently unexplained manner A wealthy village within easy reach of Nkoranza where treatment was available, had a yaws incidence of 23%, while in a comparatively poor and remote village, in which treatment was not available, the incidence was 0 3% It appeared that the incidence was not highest where the density of population—based upon figures given in the *Atlas of the Gold Coast* (5th edition)—was greatest There was no apparent relation to rainfall but most areas where yaws occurred were in the savanna rather than the forest type of country

[a] All quotations for which no specific reference is given are taken from the replies to the questionnaire sent out by the author — Ed

Yaws also occurs in the southern districts, as is shown in the report of the survey of Colbourne et al [6]

The Gold Coast reply wisely states that "to assess, with any degree of accuracy, the relative importance in the epidemiology of yaws of the various factors, rainfall, climate, etc, it would be necessary to compare areas alike in all respects save the factor under consideration" It is doubtful whether this has ever been done in Africa

Kenya

Yaws is endemic on the coast and in Central and Nyanza Provinces, and is associated with close settlement and high population density

Mozambique

Yaws is "like the palm trees which flourish in the warmer, more humid coastal areas" It is more frequent where vegetation is dense

Nigeria

Yaws is most frequent in dense populations where there is little variation in temperature, where the humidity is fairly high, and where the average rainfall is 45 90 inches (1,150-2,280 mm) It occurs at all altitudes and in all types of country between heavy forest and dense savanna Yaws at one time occurred throughout the south-eastern areas and in parts of the north It is at present most frequent in the south-eastern part of the country and in the British Cameroons Simpson [80] states that, other things being equal, the flat fertile country with much vegetation would be expected to have more yaws than the less fertile dry areas At Wum in the British Cameroons, where he worked, the altitude was 4,000 feet (1,200 m)

Northern Rhodesia

Yaws is prevalent in the Zambesi valley and in the north west of the territory near the Belgian Congo border No relationship to rainfall has been noted Yaws probably occurs not only in the valleys, which are about 2,000 feet (600 m) above sea level, but also in the plateau areas at 4,000-5,000 feet (1,200-1,500 m)

Nyasaland

Yaws appears to be confined largely to the lower-lying areas along the shore of Lake Nyasa and along the Shire River which flows south from the southern end of Lake Nyasa to join the Zambesi In these areas the population is "very dense in relation to that of the high ground to the west" Population densities for the provinces range from 27 to 83 per square mile

(10-32 per km²) from north to south Karonga at the north end of the Lake is 1,600 feet (490 m) above sea level and Port Herald at the southern end of the territory is 190 feet (58 m)

The mean annual temperature ranges from 75 2°F to 78 3°F (24 0°-25 7°C) and the average annual rainfall from 30 to 52 inches (760-1,320 mm) The relatively intense cultivation is mainly rice and cotton

Portuguese Guinea

Yaws is endemic throughout the territory The climate is of the coastal equatorial type with the rainy season from May to November and an average annual rainfall of 2,230 mm (87 inches)

The incidence of yaws is highest in the coastal areas, where the vegetation and water are more abundant, the population density is highest—14 per km² (36 per square mile)—and the occupation is chiefly the cultivation of rice in contrast with a lower incidence in the interior, where the vegetation is more open (savanna), the density of population is lower—minimum of 6 per km² (15 per square mile)—and the population is of a more developed civilization

Sierra Leone

Incidence is highest in the north, which is more hilly, hotter, drier, and more thinly populated than elsewhere Harding [15] was unable to correlate yaws incidence with vegetation, soil, or altitude

Somalia

Simmons et al [29] state that yaws occurs in the Shibeli valley between Bulad, in Ethiopia, and Bulo Burti, and in villages along large rivers it is rare elsewhere

Southern Rhodesia

Yaws is endemic in the north of the territory along the Zambesi River where the population density must be at least 100 per square mile (38 per km²) in the small endemic area This area is 1,000-2,000 feet (300-600 m) above sea level and is hot and dry for most of the year

Yaws may also be endemic *in the south-eastern area, which is* 2,500-4,000 feet (750-1,200 m) above sea level and is well watered with an annual rainfall of 25 35 inches (630-890 mm) Humidity is low in the dry winter Here, however, the picture appears to be complicated by the existence of endemic non venereal syphilis (' njovera ") [31] [32] Since yaws is said not to be present in the adjacent Bechuanaland and Union of South Africa it may well be absent from this part of Southern Rhodesia Endemic syphilis

is present in the former and in Swaziland [31] and may perhaps be present in the latter

Spanish Guinea

In the islands included in these territories yaws is probably not endemic The most important island is Fernando Po In Rio Muni, on the mainland, the temperature and humidity do not vary much throughout the year. " It does not appear that the degree of endemicity has any relation to the climate, *which is the same in the island territories, where yaws is rarely* observed " The population is largely settled along the main lines of communication and the general population density is 9 per km² (23 per square mile)

Tanganyika

At present yaws is most frequent in the western areas along Lake 'anganyika and in the Southern Province

Iganda

No part of Uganda is free from yaws Europeans, Asians, Africans in Government employment under medical supervision, and upper-class Africans whose families do not associate with infectious patients do not ontract yaws The incidence of yaws is highest in the north-western and outh western parts of the territory The geographical factors influencing he incidence in Uganda are obscure High incidence has been found in reas at 2,000 feet (600 m) above sea-level (East Madi) and at 6 000 feet 1,800 m) (Kigezi) with mean annual temperatures ranging from 78°F 25 6°C) to 61°F (16 1°C) An analysis of meteorological data showed no orrelation between yaws and annual rainfall, days of rain, mean temperature, relative humidity, cloud, or thunderstorms The physical and geological tatus of districts with the highest yaws incidence ranged from drying alluvial swamp on a tilted peneplain (Lango) to hilly country on both edimentary and volcanic rocks (Kigezi) In Kigezi the population density s 200 per square mile (77 per km²), the highest in the country, while in Lango it is 57 per square mile (22 per km²), which is below the average.

Seasonal Incidence

In most countries no data on seasonal incidence were available In Eastern Sierra Leone, Harding [15] observed that the incidence of secondary skin lesions and plantar lesions was higher in the wet season than in the dry season and gave the following table (see table I)

TABLE I PERCENTAGE SEASONAL INCIDENCE * OF CERTAIN YAWS LESIONS – SIERRA LEONE

Type of lesion	Wet season	Dry season		Wet season		
	October November	December January	February March	April May	June July	August September
Infectious lesions	4 4	2 1	1 2	3 3	2 4	4 6
Active non infectious plantar lesions **	16 4	11 9	6 9	7 8	8 4	11 6

* Based upon monthly examinations of an untreated community of 1 400 persons for one year
** Marked lesions with pain

He stressed the importance of recognizing this marked seasonal incidence in assessing the findings of surveys in relation to anti-yaws campaigns In the area in which he was working, the period of heavy rainfall was from June to October, but storms commenced in March and continued into November The average annual rainfall is 90-95 inches (2,300-2 400 mm) The mean annual temperature was 75°F (23 9°C) and the mean annual relative humidity was 83% Other observations of Harding showed that most of the secondary lesions seen in the wet season were relapses of earlier infections, since there were neither enough children born each year nor enough primary lesions to allow otherwise In British West Africa, Findlay[8] says that primary and secondary yaws are more frequent in the rainy season than at any other time Simpson[30] in the southern British Cameroons recorded an increased yaws-incidence in the wet season This he attributed to confinement in houses The annual rainfall was 100 inches (2,500 mm)

Angola It is thought that in Angola the incidence of yaws is highest in the hot rainy season of October to March

Belgian Congo In Mayumbe, Belgian Congo, although there are definite hot wet seasons (November to May) and cool dry seasons (June to October), there is no seasonal incidence of yaws

Mozambique In Mozambique the incidence is highest during the warm rainy season from October to March

Numerical Incidence

This may best be dealt with by arranging countries from east to west across the continent in belts of 10° latitude starting in the north at about 20°N and proceeding south to 20°S (see table II)

TABLE II. YAWS IN RELATION TO POPULATION AND GENERAL MORBIDITY IN A NUMBER OF AFRICAN COUNTRIES AND TERRITORIES*

Country or territory [a]	Date of observations	Population (millions)	Number of cases: yaws (thousands)	Number of cases: general morbidity (thousands)	Proportion of yaws to general morbidity (%)
Latitude 20°N - 10°N					
Mauritania	1948	0.76	0.1	104	0.12
Senegal	1948	1.89	3.2	2 002	0.15
Gambia	1949	0.25	4.9	83	6.0
Portuguese Guinea [b]	1940	0.32	—	—	4.5 [b]
French Guinea	1948	2.15	32.9	635	5.2
French Sudan	1948	3.0	7.6	876	0.8
Niger	1948	1.85	0.2	201	0.1
Haute Volta	1948	3.24	17.6	500	3.4
Chad	1948	1.43	4.2	264	1.5
Totals	—	14.9	70.7	4 665	1.5
Latitude 10°N - 0°					
Sierra Leone	1949	1.85	7.4	248	2.9
Liberia [b]	—	about 2	—	—	—
Ivory Coast	1948	2.1	107.3	1 270	8.4
Gold Coast	1948	4.5	143.8	796	18.3
Togo (French Administration)	1948	0.75	74.5	804	9.3
Dahomey (French Administration)	1948	1.4	20.8	463	4.4
Nigeria [b]	1950	19.0	300.7	1 522	19.7
French Congo	1948	0.74	25.2	505	5.0
Spanish Guinea (Rio Muni)	1950	0.2	7.4	47	15.0
Cameroons (French Administration)	1948	2.34	146.7	1 343	11.0
Gabon	1948	0.41	32.9	339	9.7
Ubangi Shari	1948	0.83	33.7	496	6.6
Anglo-Egyptian Sudan (3 southern provinces only)	1950	2.1	31.7	707	4.5
Uganda	1950	4.8	24.5	997	2.5
Somalia [b]	1947	1.75	about 0.5	—	—
Totals	—	44.8	686.4	9 537	7.2
Latitude 0° - 10°S					
Belgian Congo	1950	10.9	244.5	2 315	10.8
Ruanda Urundi	1950	—	124.2	—	—
Kenya (Africans only)	1949	5.4	10.5	1 059	1.0
Tanganyika	1949	7.0	61.8	1 064	5.8
Zanzibar	1950	0.3	5.4	85	6.3
Totals	—	23.6	446.4	4 523	7.1 [c]
Latitude 10°S - 20°S					
Angola	1950	4.1	7.4	225	3.3
Cabinda	1950	0.05	1.1	10	11.0
Northern Rhodesia	1950	1.8	0.1	151	0.06
Southern Rhodesia	1949	2.0	0.4	472	0.01
Nyasaland	1950	2.4	2.8	410	0.68
Mozambique	1950	5.7	62.8	981	6.6
Madagascar	1948	4.0	31.8	3 278	0.97
Comoro Islands	1948	0.2	15.2	160	8.5
Totals	—	20.3	121.6	5 637	2.1
Grand totals 20°N - 20°S	—	103.6	1,325.1	24 362	4.9 [c]

* The figures in this table are based upon hospital admissions and outpatient or dispensary attendances. Except where otherwise specified they are drawn from annual medical reports of the countries concerned. They represent cases treated and cannot, in many instances, be regarded as giving more than an indication of the incidence.

[a] Figures for French possessions were supplied by Médecin Général Inspecteur Jeansotte, Directeur du Service de Santé de la France d'Outre-Mer.

[b] Simmons et al.[18]

[c] The figure of 124,200 cases of yaws for Ruanda Urundi has been disregarded in the calculation of these percentages.

From table II it will be seen that, if any value can be placed on the figures, there seem to be two areas, 10° north and 10° south of the equator, which have populations of 44 8 million and 23 6 million respectively, and a total number of cases treated for all causes of 9 5 million and 4 5 mil lion respectively, of which 7 2% and 7 1% were diagnosed as yaws The northern limit of yaws is about 20°N and the southern about 20°S, an in the areas between these and 10°N and 10°S the yaws incidence is onl 1.5% and 2 1% respectively In the whole of the area, between 20°N an 20°S, the total population is about 103 million, and, of the 24 millio cases of sickness reported, over one million were diagnosed as yaws, whic is about 5% of the total sick or about 1% of the total population That the best, though not very accurate, estimate that can be made of tl incidence of yaws in Africa in recent years

In most territories from which data were available, numerical inciden varied widely In the Belgian Congo, the incidence in endemic are ranges from 7% to 22% of the whole population, but in other areas it less than 1% Yaws is prevalent among the pygmies In the Gold Coas the incidence of yaws among persons examined ranged from 1 7% in tl Banda-Sampa area (1950) to 30 9% of 36,271 persons in Dagomba (1948 but the whole of the territory has not yet been surveyed In a small villag Kwansakrom, 60 miles north of Accra, the sera from 57% of the 255 inhab tants were Kahn-positive [6] Since no syphilis was observed, it was thougl

state that the incidence in the coastal plains ranges from 3% to 12% an in the mountainous areas from 70% to 80% At Ganta, among a somewh selected dispensary attendance of 6 291, Harley [16] diagnosed 89% as suffe ing from yaws

In the south east of Sierra Leone, where an anti-yaws campaign ha been active for 10 years, the incidence of infectious and non infectiou yaws is 0 5% and 3% respectively In the north, the corresponding figure are 20% and 30%

In Uganda, the incidence among outpatients varied from 2% to 3 8 in parts of Buganda Province, from 1 5% to 8 7% in parts of Easter Province, and from 10% to 17 5% in areas of Northern and Western Pr vinces In a yaws survey in Lango in 1949 50, the following incidence were found primary lesions, 0 01%, secondary lesions, 0 9%, and tot infected persons, 12% In the West Nile (Northern Province), it wa found during trypanosomiasis surveys that 0 2% of persons had infectiou yaws lesions Sera collected in 1939 from 100 consecutive male Lang prisoners, between the ages of 18 and 35 years, gave the following Kah reactions [11]

Reaction	*Number*
4+	46
3+	21
2+	14
1+	2
±	7
negative	10

Ninety four of these persons gave a history of having had yaws in the past The 6 who denied having had yaws were under 25 years of age, the sera from 2 of these were Kahn 4+, from two others Kahn 3+, and from the remainder negative

The "inverse" relationship between yaws and syphilis (20 9% and [illegible]

patient attendances At Lira the patients with syphilis did not belong to the local tribe (Lango) and the yaws patients at Masaka were immigrants from Ruandi Urundi Davies[7] has suggested that there may have been confusion of syphilis and yaws at the beginning of this century when the "outbreak of syphilis" was recognized in Buganda[12] He says that recently endemic yaws has been recognized in Buganda, where at one time syphilis was thought to occur to the exclusion of yaws

In Tanganyika in 1950, 52,400 patients were treated Since records have been kept (1921), the greatest number of yaws patients treated in one year was 137,000 in 1930

In Angola, the incidence of yaws in the total population in 1950 was 0 17%

It is of interest that, in 1948, in the French Cameroons, out of 146,757 cases of yaws, 6 were Europeans, and in Madagascar, out of 31,840 cases of yaws, 7 were Europeans Van Nitsen[25] records 5 cases of yaws among Europeans in the Belgian Congo, and two further cases were reported in 1949 The occurrence of yaws in Europeans in Witwatersrand Mines at Johannesburg will be dealt with later (see page 159)

Incidence by Age and by Sex

Anglo-Egyptian Sudan

Most cases are seen in children, aged 5-15 years, but secondary lesions are seen in adults Females are more often infected than males

Angola

Yaws is most frequent in children and adolescents and is slightly more frequent in females than males

Belgian Congo

In Mayumbe, out of 1,500 patients treated for yaws in all stages, 72% were children, 17% were women, and 11% were men, there was no difference in the sex incidence in children or in tertiary lesions in adults, but secondary lesions in adults were most frequent in women because of their contacts with children In Mayumbe, primary lesions are most frequent between the ages of 6 months and 10 years, typical secondary lesions between 6 months and 15 years, and plantar and palmar lesion after 6 years of age (although more frequent in adults), tertiary lesions ar most frequent in adolescents and adults Van Nitsen [25] says yaws is mo: frequent in children and adolescents

British West Africa

Findlay [8] states that primary yaws is rare in patients under 18 montł of age and that most infections occur between the ages of 2 and 5 year declining gradually as puberty is approached Among women in the earl twenties there is a rise in incidence due to infections from their own childrer

French Guinea

Children from 2 to 5 years of age are most frequently affected

Gambia

The sex distribution is approximately equal

Gold Coast

Secondary yaws is often seen in adults The distribution among male and females is according to a ratio 1 1 03 or less, but Colbourne et al found more males than females infected, they thought this was becaus the women and girls wore more clothes

Kenya

Primary and secondary lesions are seen in children, and tertiary an plantar lesions in adults The sex distribution is equal

Liberia

Anigstein [1] found among 9,493 adults, 2,553 (26%) with "tertiar symptoms" and thought the true incidence would be "undoubtedly muct higher"

Mozambique

Primary lesions are more frequent in children and in women Secondary and tertiary lesions are observed in adults as well as in children and adolescents Serological reactions are positive in about 30% of adults Yaws incidence in boys and girls is equal Yaws was observed more in women than in men, but more women than men were examined

Nigeria

Primary lesions occur in infants and children, typical secondary lesions in children and adolescents, and palmar and plantar lesions in older adolescents and in adults There are, however, wide variations in these age incidences Sex incidence is equal

Nyasaland

No details are available Women and children were more frequently infected than men

Portuguese Guinea

Children comprise two thirds of the total cases of yaws Secondary lesions are most frequent, and tertiary lesions are most often seen in adolescents The sexes are equally affected

Sierra Leone

Harding,[15] working in the eastern districts of the territory, stresses the [illegible] age group 20-39 years might suggest that some of these lesions are tertiary Table III is taken from Harding,[15] who says of it

"This Table reveals two features of interest Firstly primary and secondary framboesiomata occur chiefly in the age period 0 to 9 granulomatous plantar yaws, however, is about equally common in the age groups 5 to 9 and 10 to 19 while the highest incidence of non infectious yaws occurs in the later age group 20 to 39 This suggests a natural evolution of yaws lesions first the primary infection soon followed by a secondary eruption during the first decade, this is succeeded by infectious plantar yaws which persists into the second decade though in this decade framboesiomata tend to die out next follows non infectious plantar yaws which reaches its highest incidence in the third and fourth decades after the fourth decade yaws lesions tend gradually to disappear In other words yaws is a disease of slow evolution in this country and broadly speaking runs through its various overlapping primary and secondary stages over a period of 40 years or so

"Secondly, infectious yaws is relatively uncommon after the age of 30 The dat from which the Table [table III] was compiled showed that 96 9 per cent of the infectiou lesions occurred in people aged under 30, and 99 4 per cent in people under 40 years"

TABLE III INCIDENCE* OF VARIOUS TYPES OF PRIMARY AND SECONDAR YAWS LESIONS IN GBANE CHIEFDOM, SIERRA LEONE

Type of infection	Percentage incidence by age groups (years)								Incidence at all ages (%)
	0-4	5 9	10 19	20 29	30-39	40-49	50 59	60 and over	
Primary yaws	1 16	2 8	0 56	0 19	0 0	0 0	0 0	0 0	0 68
Secondary framboesiomata	4 6	3 6	1 25	0 31	0 44	0 0	0 0	0 0	1 6
Granulomatous plantar lesions	0 9	3 8	3 03	0 86	0 3	0 2	0 0	0 0	1 3
Infectious lesions *(all types)*	*6 66*	*10 20*	*4 84*	*1 36*	*0 74*	*0 18*	*0 0*	0 0	3 58
Non infectious plantar lesions	0 9	2 8	8 5	11 1	11 2	7 8	5 9	1 4	7 1
Yaws lesions (all types)	7 6	13 0	13 3	12 5	11 9	8 0	5 9	1 4	10 7

* Expressed as percentages of people affected in each age group of a population of 45 examined during the wet season

From inquiry of 400 people with a history of yaws, Harding[15] foun that 35 5% had been infected by about 5 years of age, and 89 1% by th age of 15, thus only 10 9% had become infected after 15 years of age, an most of those were women infected by their children He found no certa cases of reinfection

Southern Rhodesia

Only a few secondary lesions are seen in adults

Spanish Guinea

Most infections occur between the ages of 7 and 11 years, and the mo frequent lesions are the primary and the secondary, the latter are rare adults The sexes are about equally infected

Uganda

During the yaws survey in Lango in 1949, the figures shown in table I were obtained

TABLE IV AGE-INCIDENCE OF YAWS PER 1,000 OF TOTAL POPULATION — LANGO SURVEY, 1949

Stage of yaws	Percentage incidence by age-groups (years)			
	0-5	6-14	15-20	20 and over
Primary	0.3	0.1	0.03	0.02
Secondary	5.2	7.6	5.4	2.0
Tertiary	0.3	1.6	4.8	6.7
Total	5.8	9.3	10.2	8.7

Palmar and plantar lesions accounted for 70% of adult cases Palmar lesions were more frequent in women, but plantar lesions were equally frequent in men and women

Yaws incidence among outpatients was higher in females than in males for the period 1940-9, whereas the reverse was found for Lira (Lango) for the period 1928-36[31] However, many other factors besides illness may determine whether peasant patients present themselves for treatment

It has been reported earlier[10] that in 152 patients in the secondary stage the primary lesion had occurred in 69% by an estimated age of 5 years or less, in 86% by 10 years, and in only 10% after the age of 15 years Scars of the primary lesions were seen in 40% of these patients Of 119 tertiary cases, 20% were 10 years of age or less, and 60% were over 15 years of age

GENERAL CLINICAL PICTURE

In all countries the clinical features of the disease were said to conform to those usually accepted In most countries it was thought that other conditions did not influence the course of the disease There were either no records or no evidence of the occurrence of cardiac, ocular, or central-nervous system lesions, or of congenital acquisition

Anglo-Egyptian Sudan

Primary lesions are very infrequent, but tertiary lesions are frequent Palmar and plantar lesions occur in the secondary stage Goundou and gangosa are infrequent

Angola

The general clinical picture is that of standard descriptions Goundou and gangosa are infrequent, perhaps because most patients undergo full

treatment, these lesions are a relic of the past Malnutrition, debilitating conditions, and bacterial and parasitic infections create a predisposition to yaws It is said that the occurrence of congenital yaws is possible but ha not been observed However, it is stated that yaws is known to be one of th most common factors in miscarriage between the second and sevent months of pregnancy The Africans are aware of the advantages of prophy lactic treatment with bismuth salts during the first months of pregnancy

Belgian Congo

In Mayumbe, the most frequent sites of primary lesions are the soles of th feet, the ankles, knees, thighs, and genitals Granulomatous palmar an plantar lesions are frequent Palmar and plantar lesions, considered to b tertiary, are frequent in adults and are nearly always the only lesions present Less than 10% of lesions are tertiary Goundou is not seen but gangosa occurs In babies and children painful polydactylitis, and in older children bon and joint pains, may precede the secondary eruption Where yaws trans mission is ceasing, only plantar and tertiary lesions are seen Van Nitsen[2] says the evolution of yaws is capricious, and it is sometimes difficult t maintain its division into three stages Of 21 primary lesions, 8 occurre on the lower limbs, 4 on the genitals and 3 on the face In 1919, he was th first to recognize tertiary yaws lesions in the Belgian Congo, such lesion consist of ulcers and plantar and bone lesions In 1930-1, out of 1,447 case of yaws in the south west part of the Congo, 8% were in the primary stage 75% in the secondary, and 17% in the tertiary Plantar lesions are mor frequent than palmar lesions, both may occur in the secondary or tertiar stages Of 53 patients with plantar lesions 33 had had secondary yaw 20-23 months before and in another tertiary lesions were also present Van Nitsen states that it is often difficult to differentiate secondary fron tertiary plantar lesions, in both there may be hyperkeratosis and fissuring Gangosa is more frequent than goundou

British West Africa

Findlay[8] says it is difficult to differentiate late secondary from earl tertiary bone lesions Gummatous osteitis and periostitis develop mor rapidly and acutely than in British East Africa, with severe pain an sometimes fever Trauma may precipitate yaws periostitis Ulceration c bone lesions occurs Crab yaws with hyperkeratosis is most frequent in th rains and may follow trauma The soles are more frequently involve than the palms In Burma, during the second World War, when som West African troops did some heavy walking without boots " a veritabl epidemic of yaws feet occurred ' Ganglia were frequent among Africar soldiers Yaws was the most frequent cause of rejection of recruits and th

major cause that led to the invaliding of Africans from the army Gangosa occurs in savanna and in forest regions

French Cameroons

Hallenberger[15] has published a well illustrated clinical description of yaws as he observed it nearly 40 years ago

French West Africa

Bone lesions and palmar and plantar lesions occur mostly in adults It was in the Ivory Coast that Botreau Roussel[4] studied goundou

Gambia

Dr D A Smith of the Department of Human Nutrition, London School of Hygiene and Tropical Medicine, says (personal communication, 1952) that in the Central and Western Districts of the Gambia, where he has worked for some time, he and his colleagues have noticed that although secondary and tertiary yaws lesions are numerous, primary lesions are extremely infrequent It is possible that this disease was endemic syphilis rather than yaws

Gold Coast

Findlay[8] says that out of 100 consecutive primary lesions, 57 occurred on the buttocks, perineum, or thighs, 16 on the face, 11 on the ankle or knee, and most of the remainder on the upper limbs He suggests that the primary lesions generally occur in parts of the body that are in contact with the ground when the patient is sitting Tertiary lesions are frequent Palmar and plantar lesions occur Goundou and gangosa occur infrequently as a rule, but on the border of the Ivory Coast the former is frequent Findlay[8] says that in the forest region of the Gold Coast, and in the Ivory Coast goundou occurs in 1% of the population

He also reports that in the village of Takpo, near Wa at the end of the dry season in May 1945, 3 8% of 233 children under the age of puberty showed clinical evidence of nutritional deficiency, while 14 8% of 47 children of the same age group with primary or secondary yaws showed marked signs of deficiency

Kenya

The most frequent site of primary lesions is the face Tertiary lesions are very frequent in untreated cases Plantar lesions are frequent, but palmar lesions are not often seen Goundou and gangosa occur infrequently Malnutrition, malaria, etc , aggravate the symptoms of yaws

Liberia

Harley[16] says that, in the hill country of the interior, latent disease is very prevalent and that yaws is somewhat more severe in the late stages and more varied in its manifestations than elsewhere From a statistical study of 5,597 cases of yaws attending the Ganta Dispensary, he regarded the following as the seven cardinal symptoms of yaws of value in clinical diagnosis

(1) enlarged epitrochlear glands,
(2) rheumatic pains
(3) granulomata and ulcers,
(4) periostitis and gross bone changes,
(5) planto palmar dermatitis, including crab yaws,
(6) nail changes,
(7) joint lesions

He observed a tendency for symptoms to be grouped into clinical types as follows

1 Secondary granulomata with epitrochlear glandular enlargement usually in children 1 6% of yaws cases

2 Latent yaws with epitrochlear glandular enlargement and rheumatic pains 10 6%

3 Chronic, partly latent infection, with planto palmar dermatitis associated with epitrochlear glandular enlargement and nail changes sometimes with rheumatic pain 15%

4 Severe general infection, with bone and joint lesions, epitrochlear glandular enlargement and rheumatic pain, the last being the outstanding symptom 24 4%

5 General severe infection in which ulceration is the outstanding symptom, with epitrochlear glandular enlargement and sometimes with bone or joint lesions, pain is not frequent 17 6%

6 Infrequent types such as gangosa and goundou

The nail changes and joint lesions are not described

Mozambique

Primary lesions occur most frequently on the face, buttocks thighs trunk, and legs, but primary and secondary lesions are frequently seen on the genitalia Palmar and plantar lesions are frequent but tertiary lesions are less so Gangosa is more frequent than goundou The characteristics of the disease are so constant in the territory that it is invariably noticed by the population, who can say with certainty whether or not there are yaws patients in the district Malnutrition, malaria, ankylostomiasis, and other infections may influence the progress of the disease, it has been

observed that concurrent treatment of these conditions accelerates the cure of yaws Ocular lesions are frequent in yaws No cardiac or central-nervous system lesions have been reported nor have cases of congenital yaws but "we are ourselves quite sure that *Treponema pertenue* must behave in the same way as *T pallidum*"

Nigeria

Primary lesions are found on the face, trunk, arms, and legs, in that order of frequency Tertiary lesions have decreased in frequency in the past 20 years Palmar and plantar lesions are frequent in both the secondary and tertiary stages but far more frequent in the latter

Findlay[8] says that in Ogoja and Okigwi, in southern Nigeria, 75% of recruits for the army were rejected, chiefly because of yaws, these included plantar lesions and chronic bone lesions, ulcers, and tissue paper scars on the legs Goundou and gangosa are now most infrequent Jelliffe[19] has described one form of late tertiary palmar lesions as "ghoul hand" Jelliffe & Humphreys[20] call attention to changes on the soles of African soldiers which they think are due not to yaws but probably to injury

Simpson[30] reported mucous membrane lesions on the palate, uvula, and tonsil in 3 2% of 720 cases, with frequent resultant scarring He regards the following as tertiary lesions ulceration often ending in contractures, rhagades, and microstomia dry fissured and desquamating plantar and palmar lesions (granulomatous lesions of the soles were not seen), osteitis, and periostitis, although his illustrations include bone lesions of the secondary stage Sabre tibia was not seen Gangosa was more frequent than goundou Ganglia occurred

Nyasaland

The most frequent site of primary lesions is the face Tertiary lesions are "most commonly seen" Palmar and plantar lesions are seen in the tertiary stage, but goundou and gangosa are not frequent Crab yaws is frequent Juxta articular nodules and sabre tibia occur Dupuytren-like contractions of the hand are often seen

Portuguese Guinea

The most frequent sites of the primary lesions are the upper limb, lower limb, and face, in that order, but they may also occur on the head trunk, margin of the anus, neck, heart, abdomen, and scrotum Tertiary lesions are less frequent than secondary lesions and probably constitute 6%-7% of all cases Secondary lesions are very frequent Tertiary lesions comprise osteitis, bony deformities such as sabre-tibia and spina ventosa, gangosa, plantar keratosis, and chronic ulcers Palmar and plantar lesions are not very frequent Gangosa is more frequent than goundou

Sierra Leone

Tertiary lesions are not frequent and, in general, the clinical features conform to those usually accepted Harding[15] reports that 87% of 400 people with a history of yaws stated that the primary lesion occurred on the leg at, or below, the knee, and that this was confirmed in most cases by the finding of the scar of the primary lesion

Southern Rhodesia

Primary lesions often occur on the face and neck Tertiary lesions are occasionally seen in older people Palmar and plantar lesions are not frequently reported, but it is suggested locally that they may not be recognized as such Goundou and gangosa are infrequent

Spanish Guinea

The most frequent sites of the primary lesions are the face, thighs and buttocks Tertiary lesions are rare, the primary and secondary being the most frequent patients seek treatment early in the disease Plantar lesions are more frequent than palmar lesions especially in the secondary stage. Goundou and gangosa are practically unknown The only clinical feature that may be especially noted is "rheumatism" ("el reumatismo") which attacks many patients after the disappearance of the lesions

Uganda

Personal experience suggests that primary lesions are most frequent on the leg There is some difference of opinion in classifying lesions as late secondary or tertiary The results of tertiary lesions are frequently seen in areas where infectious yaws is not frequent After treatment in Lango northern Uganda, it seems that in the secondary stage typical secondary lesions, often a relapse eruption, may appear in phalangeal flexures followed by a wet exfoliation which responds well to treatment In the tertiary stage, dry palmar and plantar desquamation with deep cracks resistant to treatment may persist for years However, a wide range of secondary and tertiary palmar and plantar lesions have been reported in Lango,[10] including all those illustrated by Baermann[2] as having been observed in Java Gross goundou was not frequently seen, but minor degrees of goundou were observed in 15% of 152 secondary cases with bone lesions Gangosa was not frequent, but many bone lesions were observed[12] Ganglia of the wrist and hydrarthrosis were observed in both the secondary and tertiary stages, and a number of less characteristic secondary skin lesions occurred[10] Secondary lesions on the buccal mucosa were also found in 6% of the same 152 secondary cases The micro-

scopical appearance of these lesions was identical with that of typical secondary skin lesions [9]

IMPORTANCE OF YAWS TO THE COMMUNITY

Anglo-Egyptian Sudan

Yaws is not an important disease in the country as a whole, although where it occurs it is an important cause of suffering

Angola

Yaws lesions are relatively painless and patients do not show great suffering Miscarriage is frequent and often causes sterility or death of the mother Trypanosomiasis, malaria, and intestinal parasites are all more important than yaws

Belgian Congo

In Mayumbe, yaws is a notable cause of suffering but causes little economic loss as it occurs mostly in children Other venereal diseases, malaria, respiratory diseases, and phagedenic ulcer are more important than yaws Trypanosomiasis has practically disappeared from Mayumbe Van Nitsen [25] says, however, that yaws is one of the great scourges of the African in the Belgian Congo, and in highly endemic areas is responsible for more suffering and misery than all the other diseases put together Elsewhere, plantar lesions, and the deformities resulting from tertiary lesions, often cause considerable incapacity In 1938 more cases of yaws were treated than of any other disease

Comoro Islands

Phagedenic ulcer is the most frequent cause of morbidity, yaws is the second, and malaria the third

Gambia

Yaws is probably of relatively little importance as a cause of economic loss Malaria, trypanosomiasis, and leprosy are more important diseases

Gold Coast

Probably, where yaws is prevalent, deformity and bodily suffering are frequent Where yaws incidence is high, economic loss from reduction in man power is noticed Yaws is regarded as one of the most prevalent and important diseases, but malaria may be more important

Dr G F T Saunders regards the suffering from yaws as very great and includes rheumatic pains in children, and chronic ' rheumatism ", ulcers, and deformities in adults He regards yaws as a constant drain on the economic resources of a community In one area, after mass treatment, there was a reduction in tertiary yaws, and it was said that the chi had less difficulty in getting work done at periods of intensive farm wor the population attributed this to the effects of the anti yaws campaign

Kenya

Yaws is regarded as a great cause of suffering and of economic lo: Tropical ulcer, malnutrition, tuberculosis, and pneumonia are, howev some of the diseases of greater economic importance than yaws

Mozambique

' Yaws is considered as a venereal disease and consequently shamel and the patient is obliged, voluntarily, to shun his family and neig bours and to hide himself in the bush instead of seeking treatment in t Health Service Clinics Hence, gangosa serious mutilations, and advanc bone lesions are frequent and cause incapacity " Out in the bush i found legions of unfortunate people, dragging out their miserable existen incapable of any social contribution, a complete economic loss, who cou have been saved for the most part with a little more propaganda a assistance "

Leprosy (5%), bilharziasis (80%-90%), intestinal infections (especia ankylostomiasis) tuberculosis, malaria, and trypanosomiasis, are all mc important than yaws

Nigeria

Yaws was a great cause of suffering and interfered with work, but is much less important now Malaria is the most important disease in t country, many others, especially meningococcal meningitis and vario in epidemics, are much more important than yaws Helminthiasis is u quitous and causes much sickness In the northern areas, dracontiasis very important

Simpson[30] reports that 14 3% of persons over 20 years of age co plained of rheumatic like pains which he attributed to yaws He stai that the local Africans believe that an extensive secondary eruption is r followed by later yaws lesions

Northern Rhodesia

Yaws is not an important disease except in the Zambesi Valley

Nyasaland

Bilharziasis, malaria, and venereal diseases are more important than yaws

Portuguese Guinea

Yaws is not, in general, a cause of suffering except when extensive secondary lesions or deformities are present It is not considered an important cause of economic loss, since children are the chief sufferers Malaria, trypanosomiasis, respiratory infections (especially tuberculosis), and helminthiasis (especially ankylostomiasis, filariasis, and bilharziasis) are more important than yaws

Sierra Leone

Plantar lesions are frequent and, if severe, cause suffering and interfere with work Elephantiasis and leprosy are less frequent but cause greater incapacity Gonorrhoea causes considerable suffering

Southern Rhodesia

Yaws is not a very important or disabling disease Malaria, bilharziasis, and tuberculosis are more important

Spanish Guinea

Yaws is not a great cause either of suffering or of economic loss, since it mainly affects children Trypanosomiasis, leprosy, malaria, and ankylostomiasis are more important than yaws

Tanganyika

In endemic areas, the bony deformities and crippled feet and hands make yaws a serious disease, lower the general efficiency of labour, and may be a primary contributory cause of the alleged shortage of the manual labour required for food production

Uganda

Bone pain, ulceration, and deformities are important causes of suffering Yaws causes a significant loss of agricultural labour In the Lango survey (1949), it was found that about a third of the yaws patients had tertiary lesions, and these presumably interfered with their activity The anti yaws campaign in Lango in 1949-50 cost the African local government about 8% of its revenue, and attendance for treatment resulted in

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Kenya

Yaws is regarded as a great cause of suffering and of economic loss Tropical ulcer, malnutrition tuberculosis, and pneumonia are however some of the diseases of greater economic importance than yaws

Mozambique

" Yaws is considered as a venereal disease and consequently shameful and the patient is obliged, voluntarily, to shun his family and neighbours and to hide himself in the bush instead of seeking treatment in the Health Service Clinics Hence, gangosa, serious mutilations, and advanced bone-lesions are frequent and cause incapacity " Out in the bush we found legions of unfortunate people, dragging out their miserable existence incapable of any social contribution, a complete economic loss, who could have been saved for the most part with a little more propaganda and assistance "

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the loss of perhaps 6 working days for a tenth of the population In the country as a whole, yaws is less important than the following two groups (1) diseases of the skin, cellular tissue, bones, and organs of locomotion (2) injuries resulting from violence In Lango, coughs, colds, and trauma were the only causes of outpatient attendance more frequent than yaws[11]

STATUS OF COMMUNITIES IN WHICH YAWS IS ENDEMIC

Anglo-Egyptian Sudan

Yaws occurs in the southern part in Nilotic peoples of poor social development, economic condition, and hygienic status Their main occupation is pastoral The areas are usually very isolated, but medical facilities and schools are rapidly increasing

Angola

Yaws is more frequent where the hygienic status is low

Belgian Congo

In Mayumbe, social and economic conditions are good and the chief activities are agricultural Caloric intake is adequate, but that of protein is deficient Housing and hygiene are poor and children are ill clad Treatment is available every 25 km at rural dispensaries There are schools in many villages and in all missions In the Belgian Congo, it is widely thought that indigenous beliefs and practices have little influence on the incidence of yaws but that poor hygienic standards affect it considerably Improved standards of living are associated with a decrease in yaws Van Nitsen[25] says that yaws in this country is a disease associated with poor living conditions

Gambia

Yaws occurs in peasant farming communities consisting of small villages Overcrowding is frequent sanitation is primitive, and hygiene poor Cash incomes are low, and nutrition is at subsistence level No yaws areas are particularly isolated and treatment is available at clinics within 5 to 10 miles (8 16 km) of all villages Schools do not exist in all districts but the number is increasing

Gold Coast

No study has been made of this aspect, but at Kpandu in British Togoland—a wealthy cocoa growing area with many schools, reasonably good

hospital and dispensary facilities, and good communications—there was a yaws incidence in 1949 of 20 6%, while at Dagomba in the north-east—an underdeveloped area with a lower standard of living, fewer medical facilities, few schools, and poor communications—there was a yaws incidence of 30 9% in 1948 Dr G F T Saunders says that yaws occurs in the forest kingdom of Ashanti and the Sudanic kingdoms of the Northern Territories, all of which are highly organized It was, however also prevalent in the Lawra district (north west) where development had been slow In 1928 it was believed in Lawra that the disease had been introduced fairly recently from Kumasi in the Ashanti kingdom The 1950 survey of Lawra disclosed an incidence of yaws of only 1 7% of 72,070 persons examined In Ashanti, which is wealthy and where yaws is endemic, the houses and people are clean but there is much refuse in the vicinity In the Northern Territories, villages are usually rather dirty The main occupations in yaws areas are agricultural

Kenya

In yaws areas, the social development is primitive, economic conditions and hygienic status are low, and the occupation is agriculture Endemic areas are not isolated, and treatment facilities are accessible except in the Tana River district Schools exist in all areas

Mozambique

Yaws is most prevalent among people who are socially and economically underdeveloped and are remote from more developed centres In these areas hygiene is poor and schools are few In addition to the many health offices (delegacias de saude) throughout the territory, innumerable health service posts', both fixed and mobile are being started These posts are staffed by personnel from the regions they serve, who have been trained in central hospitals The mobile units visit communities on days when the tribal authorities have assembled all yaws patients

Nigeria

Yaws communities are usually still in the close family group stage of development Their economic condition is variable but usually poor their hygienic status is invariably low, and their occupation is agricultural The present yaws areas are usually rather isolated However there are now few areas where treatment is not available within a range of 20 miles (32 km) The presence of schools is directly related to the economic condition of the community In Wum in the Bamenda District of the British Cameroons, Simpson [30] found that 23 out of 36 primary lesions occurred on the buttocks, genitalia, or perineum This he attributed to the practice of the children to sit naked, huddled round fires in the huts

Portuguese Guinea

Yaws is endemic in areas of poor social development, economic c ditions, and hygienic status Agriculture, especially rice growing is chief occupation Yaws areas are 30 60 km (18 37 miles) from "civilize centres Treatment is readily accessible throughout the territory, and some rural areas rudimentary schools already exist

Sierra Leone

Yaws is more frequent in less advanced village communities, v practise polygamy and live mainly in single roomed mud huts Th people are largely self supporting but poor Their main activities are ri growing and palm-fruit collecting A few areas of high yaws incide may be as much as 30 miles (48 km) from a road but most are within 10 m (16 km) The standard of hygiene in rural areas is very poor Onl small proportion of the population lives within 8 miles (13 km) of a p manent treatment-centre Schools are not frequent in yaws areas Hardin reported a higher yaws incidence in primitive tribes with poorly develo social and hygienic status

Southern Rhodesia

In the Zambesi Valley the social system is well organized but liv conditions and hygiene are below those of the rest of the country A culture is the main occupation, but many males seek employment in mi The Zambesi area is isolated by 150 miles (240 km) of poor dry weat road from the nearest clinic at Gokwe Medical attention is restric to a six weeks' patrol each August if a medical officer is available, th was none in 1951 The most southern possible focus (Port Victoria well provided with 3 hospitals, 20 clinics, and 8 missions, many scho also exist there, while there are few, if any, in the Zambesi area

Spanish Guinea

The most important activities are the timber industry and the cultı tion of coffee and cocoa Yaws areas are relatively isolated but co munications are fairly good Although living conditions are crowded, people are clean and bathe daily They are usually poorly clad Tre ment facilities are relatively good, and there are schools in each dist capital and also in rural settlements

Uganda

The population of areas where the yaws incidence is highest are some respects, among the most underdeveloped in the country They h

been in contact with Europeans for a fairly short period, before which they were relatively isolated and little influenced by the African kingdoms of Bunyoro and Buganda Their economic development lags behind that of the rest of the country, partly because of the difficulty of transport to the relatively inaccessible districts Their occupations are almost entirely agricultural, such as the production of cotton and oil seeds All areas provide labour for other districts in Uganda The northern areas are isolated by the Nile, Lake Albert, and the extensive swamps associated with Lake Kioga The mountainous character of Kigezi (in the south west) tends to restrict free intercourse Differences in tribe, language, and race exist between the northern and the southern yaws areas and between these and areas where yaws is absent or of much lower incidence Hygiene in yaws areas is primitive in many ways, although the people are personally clean, improvement is, however, taking place Medical facilities are readily available and few persons are more than 10 miles (16 km) from medical assistance Roads are good and district ambulances can reach most places Although there are government and mission schools scattered throughout the country, they are less numerous in yaws areas

THE USUAL MEANS OF TRANSMISSION

No systematic investigations had been carried out anywhere on transmission or on the incubation period of yaws

Anglo-Egyptian Sudan

Contact is the main cause of infection and is demonstrated in child to mother infections Flies probably play a part in transmission as the endemic-yaws areas are cattle areas where flies are abundant

Angola

Yaws is highly contagious, flies, direct contact, and sexual relations are the most frequent means of transmission

Belgian Congo

Transmission is by direct contact, usually child to child, the crowding of naked children in huts at night is probably important [25] Van Nitsen is satisfied that domestic flies are able to transmit the disease, and it is possible that some biting insects may occasionally do so

British Cameroons

Simpson[30] states that species of *Musca* are abundant but it is not known whether they assist in the transmission of yaws The practice among the Bamenda of sending children away from their parents to be brought up by relatives has demonstrated that healthy children joining infected ones have never developed yaws within less than 3 weeks

Gambia

No special knowledge is available, but transmission by flies it is thought may well be an important factor

Kenya

' Transmission is thought to be associated with flies and dirt "

Mozambique

Yaws is usually transmitted by direct contagion in which sexual contact also plays an important part Certain blood sucking insects such as bugs and flies may play a part

Northern Rhodesia

Transmission is by direct contact

Portuguese Guinea

It is generally accepted that transmission is by contact with infectious patients Flies do not appear to be important

Sierra Leone

Harding[15] states that in the area where he worked there was no evidence that insects played any part in transmission and flies were not usually numerous He significantly says

" Yaws is in fact in Sierra Leone a house disease and new cases commonly become infected from other children in the same family or sleeping in the same hut, and all the evidence points to direct contact as the mode of spread

These huts were about 8 feet (2 5 m) in diameter and housed 4-5 persons[14]

Spanish Guinea

Transmission is by direct contact The domestic fly can have but little influence in transmission since it is infrequent throughout the country

Uganda

Direct skin contact is thought to be the usual means of transmission, facilitated by scanty clothing, primitive housing, and close contact between members of a family Personal cleanliness is often limited by inadequate water supplies Flies are often seen clustered on ulcers or at conjunctival discharges, but no evidence is available concerning the transmission of yaws by flies

PRESENCE OF SYPHILIS IN YAWS COMMUNITIES

Anglo Egyptian Sudan

Hewer,[17] in a clinical study of 250 cases of yaws and syphilis among negroid races in southern Sudan, found cutaneous manifestations so protean that differentiation of the two diseases was impossible Hewer [18] says that he observed " a gradual gradation between the types encountered in the south and those in the north, where the disease, especially round Khartoum, was frankly venereal syphilis " In the north, neurological signs were found He noted no histological differences between yaws and syphilitic lesions and thinks that clinical differences are due to differences in race and not in causal organisms Bloss, however, states that syphilis is present in the yaws areas but that it affects different age groups Bloss [5] says that yaws is more frequent among the pastoral Nilotic tribes, who may be regarded as " blood and milk " eaters, than among the agrarian Zande, who are vegetarians

Belgian Congo

Syphilis occurs in Mayumbe but is less frequent than gonorrhoea Syphilis and yaws are not frequent in the same community Yaws appears to give some protection against syphilis In 1950 in the Belgian Congo, 244 570 cases of yaws and 95,770 cases of syphilis were found Van Nitsen [25] says that most doctors in this country feel that yaws and syphilis are two diseases He quotes some other workers in the Belgian Congo who have reported a few yaws patients who have contracted syphilis In areas where yaws has long been endemic syphilis has been introduced more recently

Gambia

No reliable information is available, but there is a general impression that syphilis is more frequent in the chief seaport, Bathurst, and yaws in other communities

Gold Coast

No accurate information is available on the incidence of syphilis yaws areas, although syphilis is known to occur in other parts, particula along the coast Dr G F T Saunders's experience suggests that syph was practically absent in yaws areas

Kenya

Syphilis and yaws are present in all areas Bejel is thought to be wid present in Northern Frontier District Carman [5] has reported a case simultaneous yaws and primary syphilis in an African, the syphilitic ma festation occurred eight months after the primary yaws and during relapse of secondary yaws skin lesions

Mozambique

Syphilis is present throughout the territory, it is more prevalent some areas than in others This is also observed in yaws "There does r appear to be any relationship between the two diseases"

Nigeria

Syphilis is comparatively frequent in the seaports and in the dry northe areas, Findlay [8] says that, in the latter, yaws is "relatively uncommon Simpson [30] in the British Cameroons thought that yaws and syphilis w different diseases, and the local Africans had no doubt that they we Yaws had been present from time immemorial, but syphilis was a n disease

Portuguese Guinea

Syphilis occurs in Africans both in districts where yaws is enden and in those where it is absent It is less frequent than yaws, althou patients with primary syphilis and exuberant local manifestations seen Syphilis occurs chiefly in relation to "civilization"

Southern Rhodesia

There is no evidence that syphilis is present in the yaws area of t Zambesi Valley However, syphilis and "njovera both occur in t south-eastern Fort Victoria districts where it is uncertain whether ya is endemic This is discussed by Willcox [31, 32] who also observed "njovera or endemic non venereal syphilis, in Zambesi valley patients in the nort west

Spanish Guinea

Syphilis occurs throughout the country, but is less frequent than in any European country It is not thought that there is any relationship between yaws and syphilis, as occasionally only a short time after a patient has been cured of yaws a hard chancre may be contracted However, in Nieffang, where the yaws incidence was highest in 1950 (12 8% of the population, and 28 9% of all patients), syphilis was more frequent than elsewhere It is thought that special conditions might be present there which influence the virulence of the treponemes

Uganda

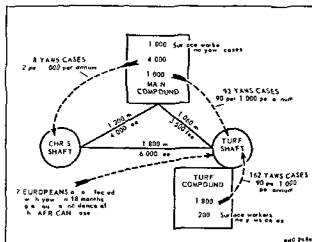
Syphilis and yaws are present in all districts in differing ratios Probably if sufficiently small, circumscribed communities were studied, it would be found that one disease alone was present in any one community Hackett[11] reported that the causes of outpatient attendances (annual average 14,700) at Lira (Lango) from 1928 to 1936 were 30% for yaws and 1 1% for syphilis, while outpatient attendances (annual average 16,207) at Masaka from 1930 to 1938 were 1 6% for yaws and 17 5% for syphilis At these clinics it was noted that at Lira syphilis occurred almost entirely in the immigrant population, while at Masaka that was true for yaws At Lira there were large numbers of children with characteristic secondary yaws skin lesions, few genital lesions in young adults were seen At Masaka there were many young men with genital lesions and young women with papular eruptions, few patients with secondary yaws were seen

OUTBREAKS OF YAWS IN WITWATERSRAND MINES, UNION OF SOUTH AFRICA

Robinson Deep Outbreaks

Scott[27] reported the occurrence of 338 cases of yaws in the Turf Shaft Robinson Deep Mine, Johannesburg, in 1931 Occasional cases of yaws had been diagnosed by the mine medical officer between 1915 and 1925 From 1925 to 1931, with a change of medical officer, such cases were diagnosed and treated as syphilis Of the first 254 cases in Africans in 1931 162 lived in the Turf Compound and 92 in the Main Compound (see fig 2) Although Africans who worked in the Chris Shaft lived in the Main Compound, only 8 cases of yaws occurred among them and none among surface workers This indication that infection occurred underground in the mine was further supported by the fact that 7 European miners had been infected with yaws during the previous 18 months while no cases had

FIG 2 DISTRIBUTION OF FIRST 254 CASES OF YAWS IN AFRICAN MINERS, ROBINSON DEEP MINE UNION OF SOUTH AFRICA, 1931



Based on Scott[1]

occurred in related mines where conditions were similar It is stressed that the surface of the ground in this area is 6 000 feet (1,800 m) above sea level with cold nights while by day the miners were working at 1,000-2,000 feet (300-600 m) below sea level, bathed in perspiration, with atmospheric temperatures of 88° 92°F (31 1°-33 3°C) dry bulb and 87° 91°F (30 6° 32 8°C) wet bulb (see fig 3) Scott[27] had water, slime, and rats examined for *T pertenue* without success

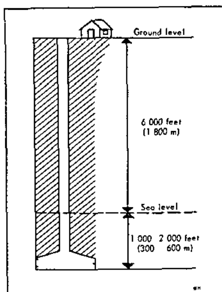
The observation of the course of the outbreak was made easy by a requirement of the Miners' Phthisis Act of the Union of South Africa that every African miner must be weighed naked once each month Most patients when recognized or when they reported sick already had well developed secondary skin lesions Thus, the time from the appearance of the primary lesion to the development of the secondary eruption must have been under 4 weeks Most primary lesions developed in small wounds or abrasions, and two developed in recent vaccination scars They occurred on all parts of the body except the feet and ankles, which were covered by boots extending well up the calf In a few cases no primary lesion was recognized

Despite all sanitary measures on the surface, the incidence of yaws rose from 11 patients in January 1931 to 57 in October, with a total of 338 for the year out of a population at risk of about 3,000 Africans

Of 111 patients treated with 0 2 0 75 g of neoarsphenamine twice weekly and 2 ml of Bicreol (0 15 g of bismuth per ml) once weekly for 4 weeks the sera from 63 were examined 1 10 months later (average 7 months),

and 44 (70%) gave negative or doubtful Wassermann reactions Of 254 patients receiving this treatment, 15% had clinical relapses within 3 weeks to 7 months (average 3 4 months) after treatment Sixty-one patients were given 0 45 g of neoarsphenamine and 0 19 g (3 grains) of intramuscular bismuth sodium tartrate each twice weekly for an average of four injections of each The sera from 6 taken 2-6 months later were all Wassermann negative No relapses occurred in 55 patients observed 1 9 months after treatment

FIG 3 SCHEME OF TURF SHAFT, ROBINSON DEEP MINE, 1931

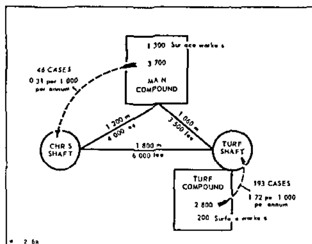


Temperatures wet bulb 87° 91 F (30 5° 32 8 C)
dry bulb 88 92 F (31 1° 33 3°C)

Three or four weekly intramuscular injections of 0 19 g (3 grains) of bismuth sodium tartrate were followed by 32% of relapses out of 50 patients 2 weeks to 4 months Two hundred and four patients were treated with 0 19 g (3 grains) of bismuth sodium tartrate twice weekly for six injections 3 developed stomatitis, 40 (20%) relapsed in 1 6 months (average 3 5 months) Of 18 patients who received this treatment, the sera from 4 were Wassermann negative and in 3 the reactions were doubtful (duration of observation not reported) A number of other chemotherapeutic courses was tried

Scott [28] reviews this outbreak and what happened afterwards He notes that there was no seasonal incidence, which is what would be expected since the climate at 6 000 8 000 feet (1,800 2 400 m) underground would be largely unaffected by surface conditions In 1933, the distribution of the Africans was changed (see fig 4), so that those working underground in the two shafts lived in separate compounds During 1934 7 of the 239 cases of yaws treated, 193 were from the Turf Shaft and 46 from the Chris Two patients with granulomatous plantar yaws lesions and one with hyperkeratotic plantar yaws lesions were seen Scott [28] thinks that transmission was by close bodily contact most probably while going to and from the working site in the three deck elevator cages, each deck of which would hold 20 30 Africans in close bodily contact Treatment consisted of three

FIG 4 DISTRIBUTION OF 239 CASES OF YAWS IN AFRICAN MINERS ROBINSON DEEP MINE, 1934 7



Based on Scott [38]

injections each of 0 45 g of neoarsphenamine and 0 19 g of bismuth sodium tartrate at 4- to 5 day intervals No relapses occurred, but the period of observation is not recorded

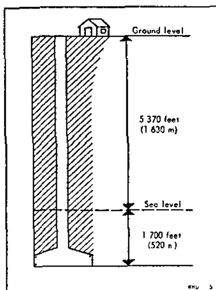
Springs Mines Outbreak

A more recent outbreak of yaws, on which no data have so far been published, occurred in the Springs Mines, Witwatersrand, in 1942, when 67 cases were diagnosed in Africans, compared with 0-6 annually in the following 8 years During the same period, 50-100 cases of syphilis were diagnosed annually in Africans from the same community, the size of which ranged from 9,000 to 11,500 people Thirty two cases of yaws were recognized in African miners on the Rand Gold Mines between 1946 and 1950 among an African labour force of about 300,000 The following account of the outbreak is based upon reports by Dr H H Wright, who has kindly given permission for its publication

In 1942, the average number of Africans employed in the Springs Mines was 11,227, they were recruited from southern Africa, and about 1,000 were from tropical areas They were housed in two compounds 2¾ miles (4 5 km) apart, known as North and South Compounds The compound rooms each housed 20-40 Africans Sleeping accommodation consisted of concrete bunks jutting from the walls The Africans mixed freely in many parts of their compound

In February 1942, three European miners were diagnosed as suffering from syphilis, this they claimed they must have contracted from Africans on the mine On investigation several Africans with rashes were found working in No 4 Shaft where conditions were very hot and humid at 7,000 feet (2,100 m) below ground surface or 1,700 feet (520 m) below sea level (see fig 5)

FIG 5 SCHEME OF No 4 SHAFT, SPRINGS MINES, UNION OF SOUTH AFRICA, 1942

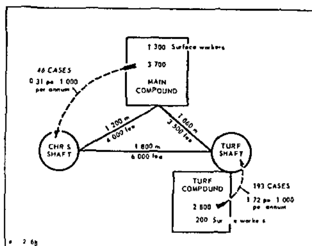


Temperatures wet bulb 90 5° 94 5 F (32 5° 34 7 C)
dry bulb 95 9°-100 F (35.5°-37 8 C)

Records of climatic conditions at the place of work for 1942 are not available, but in 1945, after thorough ventilation had been established together with an improvement in conditions, the temperature, according to the wet bulb thermometer, ranged from 90 5°F to 94 5°F (32 5° 34 7°C) and, according to the dry bulb, from 95 5°F to 100°F (35 3 37 8°C) The outbreak was well established when it was recognized, ice both Europeans and Africans regarded the rashes as due to the heat d at first disregarded them Miners while working wore only boots and orts Going to and from the working places they travelled in cages or ips in direct skin contact with each other Africans from No 4 Shaft were oused at the South Compound together with others from No 3 Shaft hese two groups mixed freely in the compound, but infection was actically limited to miners from three contiguous sections of No 4 Shaft f the 4 900 Africans housed at South Compound approximately 2,300 orked underground in No 4 Shaft, and of these approximately 400 worked the affected section of the mine (see fig 6)

No ... but it was said ... sore" was often ... were also working t the affected section of No 4 Shaft, 38 Europeans were at risk Medical ispection of all Africans working in the affected area disclosed several xtragenital primary sores, in the serum from which treponemes 'morphologically resembling *T pallidum*' were found After review of the circum-

FIG 4 DISTRIBUTION OF 239 CASES OF YAWS IN AFRICAN MINERS ROBINSON DEEP MINE, 1934-7



Based on Scott [26]

injections each of 0 45 g of neoarsphenamine and 0 19 g of bismuth sodium tartrate at 4- to 5-day intervals No relapses occurred, but the period of observation is not recorded

Springs Mines Outbreak

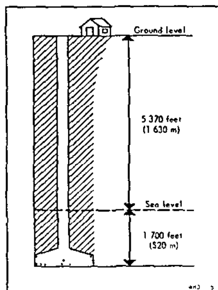
A more recent outbreak of yaws, on which no data have so far been published, occurred in the Springs Mines, Witwatersrand, in 1942, when 67 cases were diagnosed in Africans, compared with 0-6 annually in the following 8 years During the same period, 50-100 cases of syphilis were diagnosed annually in Africans from the same community, the size of which ranged from 9,000 to 11,500 people Thirty-two cases of yaws were recognized in African miners on the Rand Gold Mines between 1946 and 1950 among an African labour force of about 300,000 The following account of the outbreak is based upon reports by Dr H H Wright, who has kindly given permission for its publication

In 1942, the average number of Africans employed in the Springs Mines was 11,227, they were recruited from southern Africa, and about 1,000 were from tropical areas They were housed in two compounds 2¾ miles (4 5 km) apart, known as North and South Compounds The compound rooms each housed 20-40 Africans Sleeping accommodation consisted of concrete bunks jutting from the walls The Africans mixed freely in many parts of their compound

In February 1942, three European miners were diagnosed as suffering from syphilis; this they claimed they must have contracted from Africans on the mine On investigation several Africans with rashes were found working in No 4 Shaft where conditions were very hot and humid at 7,000 feet (2,100 m) below ground surface or 1,700 feet (520 m) below sea level (see fig 5)

Records of climatic conditions at the place of work for 1942 are not available, but in 1945, after thorough ventilation had been established, together with an improvement in conditions, the temperature, according to the wet-bulb thermometer, ranged from 90 5°F to 94 5°F (32 5°-34 7°C) and, according to the dry-bulb, from 95 5°F to 100°F (35 3-37 8°C) The outbreak was well established when it was recognized, since both Europeans and Africans regarded the rashes as due to the heat and at first disregarded them Miners while working wore only boots and shorts Going to and from the working places they travelled in cages or skips in direct skin-contact with each other Africans from No 4 Shaft were housed at the South Compound together with others from No 3 Shaft These two groups mixed freely in the compound, but infection was practically limited to miners from three contiguous sections of No 4 Shaft Of the 4,900 Africans housed at South Compound, approximately 2,300 worked underground in No 4 Shaft, and of these approximately 400 worked in the affected section of the mine (see fig 6)

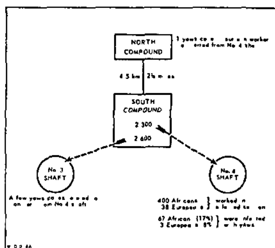
FIG. 5 SCHEME OF No. 4 SHAFT, SPRINGS MINES, UNION OF SOUTH AFRICA, 1942



Temperatures wet bulb 90 5° 94 5°F (32 5°-34 7°C) dry bulb 95 9°-100°F (35 5°-37.8°C)

No history or evidence of genital sores was obtained, but it was said that a skin lesion which failed to heal and developed into a "sore" was often the start of the disease The three European patients were also working in the affected section of No 4 Shaft, 38 Europeans were at risk Medical inspection of all Africans working in the affected area disclosed several extragenital primary sores, in the serum from which treponemes "morphologically resembling *T pallidum*" were found After review of the circum-

FIG 6 DISTRIBUTION OF CASES OF YAWS IN SPRINGS MINES 1942



stances, it was concluded that it was an outbreak of yaws The infection was probably brought in by an African from a more tropical country

All Africans from the affected area were medically examined naked every 14 days, and this was continued for 4 months after the last was discovered In addition to this examination, a general watch for any skin eruption was maintained at all possible points Most cases were recognized at the fortnightly examinations All yaws patients were isolated and treated in the mine hospital until non infective Compound rooms from which patients came were disinfected and the room contents fumigated The outbreak was confined to No 4 Shaft and the South Compound The transfer of some Africans from No 4 Shaft to other working places led to occasional cases among underground workers in other parts of the mine for example, in No 3 Shaft and one case occurred in a surface worker at the North Compound who had previously worked in the affected sections of No 4 Shaft

The primary lesions occurred on all parts of the body except the feet and ankles, which were protected by boots The distribution of primary lesions in 55 consecutive patients is shown in the following tabulation

Localization	*Number of lesions*	*Localization*	*Number of lesions*
Scalp	1	Back	9
Face	4	Elsewhere on trunk	5
Upper arm	8	Thigh	1
Elbow	11	Knee	1
Forearm	14	Leg	1

Transmission appeared to be by direct skin-contact and infection of some minor skin-lesion The method of drilling by the machine boy assisted by the spanner boy supplying extra purchase (see fig 7) probably explains the high incidence on the upper limbs and back This method of drilling is no longer in use

FIG 7 POSITION OF AFRICAN MINERS AT WORK IN No 4 SHAFT, SPRINGS MINES, 1942 ILLUSTRATING THE CLOSE BODILY CONTACT



Roughly the first half of the descent to the working site is vertical and is made in double-deck cages, each deck holding 25 men, the remainder is made in skips down an incline or on foot A skip holds 8 miners In fig 8, the front of a skip is seen, but about 2 feet (60 cm) of it are hidden below the platform, two of the 8 miners are also hidden from view

European miners usually strip to the waist after leaving the cages Europeans travel in the cages and skips at the same time as Africans,

FIG 8 AFRICAN MINERS DESCENDING IN SKIP



although at specified times the cage is reserved for Europeans Thus direct skin-contact is possible in the skips However, the position of the miners (see fig 7) would appear to explain the distribution of the primary lesions noted above The clothes worn are minimal but the head and shins are protected No factors above ground appeared important It was thought that the time between the development of the primary lesion and the appearance of the secondary eruption was perhaps as short as two weeks The occurrence of 67 cases from February to December 1942 despite vigorous control measures, among a population at risk of approximately 400 Africans gives an incidence of 17%

Treatment consisted of a 6 week course of weekly injections of neoarsphenamine (0 45 g 0 6 g 0 6 g 0 75 g 0 75 g 0 9 g) and weekly intra muscular injections of 1 ml of Bisglucol (0 2 g of metallic bismuth per ml)

The Wassermann reaction was positive in sera from all cases before treatment Response was rapid Sera from 28 patients, 3 months after treatment, were Wassermann-negative in 26 cases, doubtful in one, and positive in one, and out of 12 patients examined after 6 months, 10 were negative The two patients with positive reactions included the earlier positive patient and another whose Wassermann reaction was negative 4 months after treatment for secondary yaws, 3 months later, the reaction of this patient was strongly positive and a primary chancre of about " 4 weeks' duration " was present on his penis This is an interesting " natural " experiment in which accurate data are known concerning the infections of yaws and syphilis, the treatment given for the yaws, and the reversal of the Wassermann reaction Only one case of clinical relapse—the patient with the positive Wassermann reaction 3 months after treatment—was observed up to 5 months after treatment, but adequate observation was limited by movement of the Africans at the termination of their contracts

The outbreak, recognized in February 1942, started to abate in June, as a result of the measures taken but the last case did not occur until 24 May 1943 Only 22 cases of yaws occurred in Springs Mines in the 8 years following 1942, the number of Africans employed annually was between 9 000 and 13 000

It is of interest to note that Lister [23] reports the results of Wassermann reactions carried out on the sera from 1,200 Africans, from seven tribes, who had been passed for service in the mines, 13 4% gave strongly positive reactions (++), 1 6% positive (+), 2 8% doubtful (±), and 82 2% negative A more recent serological survey by O'Malley & Wilson [26] of 1,000 unselected Bantu in Cape Town gave 7 4% positive, 5 8% doubtful, and 86 8% negative Wassermann reactions These findings would probably indicate populations susceptible to yaws

In both these outbreaks of yaws in mines it is probable that the infection was introduced into the community by relapsing secondary cases Transmission under the conditions being discussed almost certainly depended upon only two sets of circumstances once infection was present, these were warm, humid conditions and direct infectious contact with minor skin injuries

During both these outbreaks of yaws, syphilis was also diagnosed in other African miners Both Scott [27] and Dr Wright report that some cases of yaws were diagnosed as syphilis before the outbreak was recognized However the recognition of the generalized secondary eruption of yaws is straightforward and the diagnosis is further confirmed by the illustrations in Scott [27] These outbreaks are very interesting and provide much that one would like in a planned experiment from the point of view of epidemiology, symptomatology, treatment, and prevention Should another such outbreak occur, it would offer an excellent opportunity for an intensive specialized study

Table V, based upon data from Dr H H Wright, gives possible contacts and the dates of admission to hospital of 21 of the 22 cases of yaws that occurred in African miners in the Springs Mines from 1943 to 1950, and the intervals since each was engaged for work

TABLE V DATA ON CASES OF YAWS OCCURRING AMONG AFRICAN MINERS IN SPRINGS MINES — 1943 50

Year	Case no	Tribe	Shaft no	Date admitted to hospital	Possible relationship	Interval between engagement and admission to hospital (to nearest week)
1943	1	Pondo	4	18 February		23
	2	—	—	5 March		27
	3	Shangaan	3	19 April		18
	4	Xosa	4	23 April		20
	5	Swazi	3	3 May		22
1944	6	—	—	3 April		90
1945	7	—	—	2 May		22
	8	—	—	17 July		192
	9	—	—	6 December		44
	10	Xosa	4	12 December		160
	11	Musutu	4	27 December		127
1946	12	Zulu	4	25 January	Case nos 12 and 13 admitted 6 weeks after Case no 10	52
	13	Xosa	4	25 January		54
	14	Xosa	4	13 February	Case nos 14 and 15 admitted 7 weeks after Case no 11	[illegible]
	15	Xosa	4	13 February		31
	16	Xosa	4	28 March	Case nos 16 and 17 admitted 6 weeks after Case nos 14 and 15	29
	17	Swazi	4	28 March		35
1948*	18	Nyasa	6	2 April		22
	19	Tanganyika	6	3 May	Case no 19 admitted 7 weeks after Case no 18	23
	20	Tanganyika	6	8 June	Case no 20 admitted 6 7 weeks after Case no 19	25
1950	21	—	—	15 February		31

* At an adjacent mine

If 6-7 weeks from the time of infection are allowed for the development and recognition of the secondary eruption, then 8 of the above mentioned

21 cases could have been infected from previously recognized cases Only cases where infective contact was highly probable have been noted All, except case nos 18 20, which occurred in a different section, occurred in No 4 Shaft and in the area affected in 1942 Case no 5 was a relapse of primary yaws with secondary skin lesions diagnosed and treated 26 weeks earlier Case nos 10 17 were all diagnosed while still in the primary stage This interval of 6-7 weeks is not readily accounted for unless the incubation period of yaws is about 4-5 weeks, since medical inspections were held at intervals of 2 weeks Since the other 13 patients do not appear to be thus related, the time that had passed between their employment and admission to hospital may give some indication of the latent secondary stage of yaws which they showed These times ranged from 22 to 192 weeks It must be stressed that these must remain very loose assumptions until further supporting evidence is available

DISCUSSION

In attempting to assess the extent and nature of the yaws problem in Africa, one must accept, in addition to the linguistic and geographical difficulties, the fact that accurate knowledge of any aspect of the subject is not available from all countries where yaws is endemic Figures of incidences, except those from surveys, are largely based upon returns of attendances at clinics and rural dispensaries In many such establishments an attendance is recorded every time a patient seeks treatment However, since at most such establishments the standard of diagnosis is much the same and records are kept in the same way, the figures may be comparable among themselves These figures, however, do not necessarily have any close relationship to the incidence of yaws in the community and can be used only as a rough indication In Lango, Uganda, the incidence found on survey (1949) was 12%, while that for outpatients at the main district hospital at Lira (average 1940 9) was 17 5% Diagnosis in both was based upon clinical observation, so that no account could be taken of the many patients who were in the latent secondary or latent tertiary stages In the same area[11] in 1939, positive Kahn-reactions were found in over 84% of 100 consecutive male prisoners, only 6 of whom denied having had yaws At this time the average annual outpatient attendance for yaws at the Lira hospital was 20% This shows the difficulties that may arise if one tries to get more out of these figures than they are worth

From figures available, it appears that between 10°N and 10°S dwells a population of 68 4 million, among whom 14 million sick attendances are recorded annually, of which 7 2% are for yaws There are two further smaller

zones, north and south of this area, in which the total population is 36 million, each zone with about 5 million annual sick attendances, and 1 5% and 2 1% of sick attendances respectively for yaws These zones extend away from the warm, humid, tropical area, with an average temperature above 20°C (68°F) and an average annual rainfall above 500 mm (20 inches), and are limited by more arid areas It is of particular interest that in Kenya bejel is reported to occur on the northern frontier, in Southern Rhodesia ' njovera " is reported, in Bechuanaland endemic syphilis is reported and in Gambia secondary and tertiary lesions, presumed to be yaws are frequent but primary lesions are extremely rare This is suggestive that a non venereal endemic syphilis may occur in these climatic fringe areas It is also said that, in the Anglo-Egyptian Sudan, primary lesions are very infrequent but tertiary lesions are frequent, and that, while yaws occurs in the south, venereal syphilis has displaced it in the north The picture here is not very clear, but these possible treponematosis gradations offer an interesting opportunity for investigation from many points of view

In the area of Africa in which yaws is endemic, the total population is about 103 million, the total annual sick attendance is 24 million (about 23%), and yaws attendance is 1 32 million, that is, about 5% of the total sick attendance or about 1% of the total population These figures can be safely regarded as underestimates Probably not more than 5 to 10 Europeans a year contract yaws in Africa

Within each country the incidence of yaws usually varies widely, there may be areas in which yaws is present and syphilis is absent and vice versa

Yaws is usually contracted in childhood, and secondary lesions are most frequent in children and adolescents, tertiary lesions are most frequent after puberty Infectious lesions are infrequent after the age of 30 years There may be some overlapping of these types of lesions as regards time, but if the proliferative non destructive character of secondary lesions and the destruction of tertiary lesions are accepted, one need not abandon this classification, which is useful since it recognizes infectious and potentially infectious patients The use of the term " non infectious yaws " by a careful worker such as the late Dr R D Harding was an honest acknowledgement that he found it impossible to differentiate tertiary from some non infectious secondary lesions The greatest difficulty concerns the palmar and plantar lesions, which in some parts of Africa may comprise up to 70% or more of all yaws lesions, with the highest incidence between the ages of 20 and 39 years This is an aspect of yaws which has scarcely been touched since the excellent paper by Baermann[1] although such lesions are responsible for considerable suffering and economic loss in some areas

More should be known of the significance of the proportional incidences of primary, secondary, and tertiary yaws lesions in relation to any treatment a community has received A high incidence of tertiary lesions with few primary and secondary ones might indicate a stage in the effective control of infectious yaws. Throughout Africa the incidence of secondary lesions in adults is low, which would be expected in a disease that is of long standing and is usually contracted in childhood

The incidence of primary, secondary, and tertiary lesions found in surveys in Lango among a population of 268,600 persons was 0 1%, 4 9%, and 4 5% respectively In Sierra Leone, the incidence of primary yaws was 0 68%, of secondary framboesiomata and granulomatous plantar yaws was 2 9%, and of non-infectious plantar yaws was 7 1%, no record was made of the tertiary lesions

There is no evidence in Africa that yaws causes cardiac, ocular, or central nervous system lesions

In the Gold Coast and British Cameroons, it is reported that primary lesions occur most frequently on the buttocks, perineum, and thighs, in Nigeria, Kenya, Nyasaland, and Southern Rhodesia on the face in Portuguese Guinea on the upper limbs, and in Sierra Leone and Uganda on the leg The distribution of primary lesions on areas of skin contact in African miners infected with yaws while working underground strongly suggests that the primary lesions develop where infectious contact occurs Thus it may be surmised that where these lesions occur on the buttocks the infection has come from sitting on the ground Lesions on legs might be associated with low vegetation or low-flying insects Further study is needed of this problem and of the time that *T pertenue* can survive away from the body on various substances under field conditions

In some parts of Africa, surveys have confirmed that the incidence of secondary yaws lesions is higher in wet than in dry seasons This is largely due to relapses of previous infections rather than to new infections This must be taken into account in assessing the significance of survey findings No study has yet been made of the time of appearance of secondary relapses

Because of the bone pains, palmar and plantar lesions, tertiary ulcers, and crippling tertiary lesions, yaws is a serious cause of suffering in many countries Although Van Nitsen [25] has said that in highly endemic areas in the Belgian Congo yaws is responsible for more suffering and misery than all other diseases put together, this is not usually so when countries as a whole are considered Yaws may also cause economic loss to a community by its disabling effect on adults Yaws is not an important cause of death, either directly or indirectly, and in most countries there are several other diseases of more general importance, among these are nutritional deficiences, helminthiasis, and tuberculosis

Yaws, in most countries, occurs in relatively isolated, agricultural peasant populations living in underdeveloped conditions and usually wearing few or no clothes in childhood However, yaws is prevalent in the Sudan in the pastoral Nilotic tribes and in the Gold Coast in the highly organized *Ashanti and northern Sudanic kingdoms In Ashanti*, high yaws incidences have been found in relatively wealthy communities with many schools and reasonably good medical facilities The investigation of these unexpected incidences might provide some useful epidemiological data

No investigations have been made in Africa on the transmission of yaws, and there was no evidence of congenital acquisition It was fairly widely felt that direct contact of a healthy person with an infectious patient was most important in transmission Crowding of naked children in huts at night was thought to be important to such an extent that Harding[15] regarded yaws as a house disease in Sierra Leone Although flies might *be able to assist in the transmission of yaws, there was no general feeling* that this was frequent or important

Syphilis was generally considered a different disease from yaws In some areas it was said that yaws had been present for ages while syphilis had only been introduced during the past century Syphilis was more prevalent in large towns, especially in ports, where yaws was usually absent. The absence of yaws from large towns cannot be completely explained by better and more hygienic living conditions for these are not always present The wearing of more clothing by children and perhaps less crowded conditions at night, might be contributory factors Cases have been seen where syphilis has been contracted after yaws has been cured and even while secondary yaws skin lesions were still present There are few, if any, areas where yaws and syphilis are both being actively transmitted

The outbreaks of yaws in African miners in South Africa in 1931 and 1942 are extremely interesting and deserve close study Infection almost certainly occurred only at the site of work, about 7,000 feet (2 100 m) below the ground surface under hot moist conditions and practically never while the miners were above ground which was 6,000 feet (1,800 m) above sea level The distribution of primary lesions in the later outbreak would appear to be explained completely by the areas of skin contact between the African miners while at work In the earlier outbreak, primary lesions occurred on all parts of the body except the feet and ankles, which were covered, in a few patients no primary lesions were recognized Probably over 80% of these miners at risk had negative Wassermann reactions During the first outbreak, all Africans were examined naked once each month, and it was thought that 3 to 4 weeks elapsed between the appearance of the primary lesions and the development of the secondary eruption In the second outbreak, all Africans were examined once every 14 days, so that this period appeared to be less than two weeks In both outbreaks,

primary lesions developed in small wounds or abrasions, and a few Europeans were also infected

Although a few cases of yaws have in the past occurred in African miners in South Africa, in these two years the numbers were greatly increased It might be stressed that great attention is paid to the health of these Africans so that the chief factors concerned in the transmission of the disease were the presence of the treponeme, a favourable climate, close bodily contact, and skin injuries There is no obvious reason why these should not also be the most important factors in the transmission of yaws in all endemic areas

From data relating to some infections in African miners, it is possible that the period from the infection with the treponeme to the appearance of the primary symptoms may be about 6 weeks, and that the latent secondary stage in adults may last at least as long as 160 weeks In the British Cameroons, where children were taken into the houses of relatives to be brought up, Simpson [80] states that yaws never appeared in the newcomers in less than 3 weeks

It might be said, without exaggeration, that the knowledge of yaws in Africa, and perhaps elsewhere too, has in many of its aspects not yet passed the descriptive stage In primitive communities, what medical knowledge exists is possessed by all so that the patient's diagnosis of yaws is often correct However, the patient's story of the time relationship of the course of his yaws is much less reliable, and it is unwise to generalize from such evidence

Where yaws is seen by medical men it is usually seen in "not single copies but in battalions". Its very abundance is its own undoing so far as study is concerned, for the responsible medical practitioner usually has little time to devote to critical investigation Little work has been done in yaws comparable in thoroughness to the recent studies of the epidemiology, treatment, and prevention of malaria or of African trypanosomiasis How often have selected groups been studied as if they were random samples, and how often is any form of control lacking ! Some specious general statements have been published without any hint of the evidence upon which they were based There is urgent need for applying to the investigation of yaws the scientific method, by men trained in it and free of therapeutic responsibilities For example, only one variable should be present in observations if conclusions based upon them are to be accurate and reliable, and statistical assistance must be sought in the planning and interpretation of all studies Unless that is done there is grave risk that much money may be needlessly spent in yaws control, or if, by some optimistic chance, control with modern drugs proves much easier than control with the drugs of the past and rapid eradication results, then much useful knowledge, which might have been of value in the control of other diseases, may well be lost for ever.

Annex 1

QUESTIONNAIRE ON YAWS : DISTRIBUTED IN AFRICA, AUGUST 1951

I Incidence in localities where yaws is endemic

(1) Geographical incidence relation of infection to
  (*a*) climate (temperature, humidity, rainfall)
  (*b*) geological status
  (*c*) altitude
  (*d*) vegetation
  (*e*) population density
 A map containing all the place names mentioned in the reply should be attached.
(2) Seasonal incidence
(3) Numerical incidence
  (*a*) surveys
  (*b*) clinic attendances
  } as totals and as percentages of population at risk
(4) Age incidence
  (*a*) primary lesions
  (*b*) typical secondary lesions
  (*c*) palmar and plantar lesions
  (*d*) tertiary lesions
  } In the absence of details, state whether secondary lesions occur often in adults
(5) Sex incidence

II. General clinical picture of the disease

(1) What are the most frequent sites of primary lesions ?
(2) Are tertiary lesions frequent ?
(3) Are palmar and plantar lesions frequent in the secondary or tertiary stages ?
(4) Are goundou and gangosa frequent ?
(5) Do the clinical features of the disease conform to those usually accepted ?
(6) Are there any unusual clinical manifestations ?
(7) Do any other conditions, e g , malnutrition, malaria etc , influence the course of the disease ?
(8) Have cardiac, ocular, or central nervous system lesions been observed ?
(9) Has congenital acquisition been observed ?

III. Importance of yaws to community

(1) as a cause of suffering
(2) as a cause of economic loss
(3) in relation to other diseases—i e , what diseases are more important than yaws ?

IV. Status of communities in which yaws is endemic

(1) Social development
(2) Economic condition
(3) More important productive activities
(4) How isolated are the endemic yaws areas ?
(5) What is the hygienic status of the community ?
(6) Accessibility of treatment facilities
(7) Presence of schools

V What is regarded as the usual means of transmission of yaws ?

(1) Have any investigations been carried out on this problem ?
(2) Is transmission by flies thought to be important ?
(3) What is the incubation period of yaws ?

VI Is syphilis present in any yaws community ?

(1) Is syphilis present in other areas in the country ?
(2) What is regarded as the relationship of yaws to syphilis ?

VII What papers on incidence and clinical manifestations of yaws in the country have been published ?

VIII Any other remarks

Annex 2

REPLIES TO THE QUESTIONNAIRE

Replies to the questionnaire (see Annex 1 page 174) were received in respect of the following countries or territories from the persons or offices listed below

ANGLO-EGYPTIAN SUDAN	Director of Medical Services and Dr J F E Bloss Khartoum
ANGOLA	Director of Health and Hygiene Services and Dr Antonio Ferreira Luanda
BASUTOLAND BECHUANA LAND AND SWAZILAND PROTECTORATES	Statement from High Commissioner Pretoria that yaws is not endemic
BELGIAN CONGO	Dr Thomas Director General of Medical Services and Dr Kivits and Dr Limbos Leopoldville
BRITISH SOMALILAND	Statement from Dr G Ashe Acting Director of Medical Services Hargeisa that yaws is not endemic
ERITREA	Statement from Professor G Ferro-Luzzi Asmara January 1952 that yaws is not endemic
ETHIOPIA	Statement from Professor R J Last Royal College of Surgeons London January 1952 that yaws is not endemic this was supported by Professor G Ferro-Luzzi
FRENCH TERRITORIES	Médecin Genéral Inspecteur Jeansotte Directeur du Service de Santé de la France d Outre-Mer supplied statistical data relating to the incidence of yaws in French possessions throughout the world together with brief notes
GAMBIA	Dr E J Bury Director of Medical Services Bathurst
GOLD COAST	Dr R L Cheverton Director of Medical Services Dr D Scott and Dr G F T Saunders Accra

KENYA	Dr A J Walker, Acting Director of Medical Services, Nairobi
LIBYA	Statement from Dr D K L Lindsay, Tripoli January 1952, that yaws is not endemic
MOZAMBIQUE	Director of Health Services, and Professor Prates Lourenço Marques
NIGERIA	Inspector of Medical Services, and Dr C Wilson
NORTHERN RHODESIA	Director of Medical Services, and Dr T Evans, Lusaka
NYASALAND	Dr P W Dill Russell, Acting Director of Medical Services, Zomba
PORTUGUESE GUINEA	Professor F S da Cruz Ferreira, Institute of Tropical Medicine Lisbon
SAO TOMÉ AND PRINCIPE	Statement by the Health Department that yaws is not endemic
SIERRA LEONE	Dr E. A Renner, Director of Medical Services, Freetown
SOMALIA	Statement from Professor G Ferro-Luzzi that he thinks that yaws is not endemic
SOUTHERN RHODESIA	Dr D M Blair, Director of Preventive Services for Security of Health, Causeway
SPANISH GUINEA	Dr Enrique Lalinde del Rio, Director of Colonial Health Service, Santa Isabel
TANGANYIKA	Director of Medical Services, and Dr G A Macgregor, Dar es Salaam
UGANDA	Dr W A Wilson Medical Department, Entebbe
UNION OF SOUTH AFRICA	Dr H le Riche, Director of Health and Chief Health Officer for the Union, Dr Orenstein, Chief Medical Officer Rand Mines Ltd, and Dr H H Wright, Chief Medical Officer, Springs Mines Ltd

In addition, assistance was received from Dr Wilson Rae of the Colonial Office London, in respect of the United Kingdom territories, from Dr Lionel Pedro Banha da Silva, General Agent for Overseas, Lisbon, in respect of the Portuguese territories and from Dr José A Palanca, Director General of Health, Madrid, in respect of the Spanish territories.

ACKNOWLEDGEMENTS

It is a pleasure to acknowledge the help I have received in the preparation of this paper … ff of the … African … Dagga

SUMMARY

In order to prepare this study, the author distributed a questionnaire throughout Africa in 1951, much of the material contained in this paper is taken from the numerous answers received from the various health administrations.

From these data and from other sources it appears that yaws in Africa is most prevalent in the zone 10° north and 10° south of the equator but that it extends in lower incidence north and south from that zone towards the drier areas at about 20°N and 20°S.

A section devoted to the relation of yaws incidence to climate geological status altitude vegetation and population density and prepared according to territories in alphabetical order, shows that in general the incidence is highest in more humid areas where vegetation and water are abundant and where the population is relatively dense. That there are exceptions to this is clear from the information on Sierra Leone which states that the incidence there is highest in the north which is more hilly hotter, drier, and more thinly populated. There is also evidence to suggest that the incidence rises in the hotter and wetter seasons. The numerical incidence of the disease is indicated by the fact that in the zone 10° north and 10° south of the equator 7.2% of all cases treated by the medical authorities in recent years were cases of yaws. The incidence varies widely however from one territory to another and even within one territory.

Yaws is usually contracted in childhood children up to the age of 10 years being the most frequently affected while tertiary lesions are most frequent after puberty

RÉSUMÉ

Avant d'entreprendre son étude l'auteur avait envoyé, en 1951 un questionnaire dans les diverses régions de l'Afrique. Les nombreuses réponses des administrations sanitaires lui ont fourni une partie notable des informations que contient cet article.

Les réponses reçues et diverses indications puisées à d'autres sources font ressortir que le pian est particulièrement répandu en Afrique dans la zone comprise entre 10° de latitude nord et 10° de latitude sud. Il sévit également mais à un moindre degré au nord et au sud de cette zone jusque dans les régions plus sèches situées à environ 20° de part et d'autre de l'équateur.

Dans une section traitant de l'influence que le climat les conditions géologiques, l'altitude la végétation et la densité de la population exercent sur la fréquence de la maladie l'auteur passe en revue les divers territoires dans l'ordre alphabétique et souligne d'une façon générale que le pian se rencontre surtout dans les régions humides caractérisées par une végétation abondante et une humidité élevée ainsi que par une population relativement dense. Cette règle comporte toutefois des exceptions ainsi qu'il ressort des chiffres concernant la Sierra Leone ou la maladie atteint surtout la zone septentrionale qui est plus montagneuse plus chaude plus sèche que le reste du pays et où la population est moins dense. Certaines observations semblent aussi montrer que le nombre de malades s'accroît dans les saisons particulièrement chaudes et humides. L'importance numérique de la maladie ressort du fait que dans la zone comprise entre 10° de latitude nord et 10° de latitude sud 7.2% de tous les malades soignés au cours des récentes années souffraient de pian. La fréquence varie toutefois beaucoup d'un territoire à l'autre et jusqu'au sein d'une même région.

Le pian est d'habitude contracté au cours de l'enfance et ce sont les enfants de moins de 10 ans qui sont le plus souvent atteints, tandis que les lesions tertiaires apparais

Infectious lesions are infrequent after the age of 30 The distribution between the sexes is approximately equal

In all the countries considered the clinical features of yaws were said to conform to those usually accepted, and in most it was thought that other conditions did not influence the course of the disease *There were either no records or no evi*dence of the occurrence of cardiac, ocular, or central nervous system lesions Primary, secondary, and tertiary lesions all occur with varying frequency, and palmar and plantar lesions are frequent in the secondary and tertiary stages

A section dealing with the importance of yaws to the community shows that yaws is a cause of severe suffering and economic loss in some endemic areas In few countries, however, is it considered the most important disease, malaria, trypanosomiasis, bilharziasis, respiratory diseases, and intestinal disorders, among others, are considered more important in certain areas

The disease is generally stated to be more prevalent in relatively isolated areas of poor social and economic development where the hygiene is fairly primitive, and where the occupation of the people is largely agricultural

No systematic investigations have been carried out in Africa on the transmission of yaws or on the incubation period, but the opinion is fairly general that direct contact is the most important means of infection A number of territories also mentioned that flies might assist in transmitting the disease There is no evidence of congenital acquisition, and few countries mentioned sexual contact as a means of spread

sent surtout après la puberté. Les lesions contagieuses s'observent rarement après l'age de 30 ans Le nombre des malades se repartit à peu près également entre les deux sexes

Dans tous les pays étudiés le tableau clinique du pian paraît conforme au type classique et, dans la plupart de ces territoires, on estime que son evolution n est pas influencee par d'autres maladies *Aucune observation ancienne ou recente n in*dique la presence de lesions cardiaques, oculaires ou du système nerveux central. Les lesions primaires secondaires et tertiaires se rencontrent avec une frequence variable et les stades secondaire et tertiaire s'accompagnent souvent de lesions palmaires et plantaires

Une autre section de l etude est consacree à l importance que le pian revet pour la collectivité L'auteur souligne que, dans certaines régions d endemicité cette maladie entraine de grandes souffrances et de lourdes pertes economiques Toutefois on ne la considère comme le fléau le plus important que dans un petit nombre de territoires le paludisme, la trypanosomiase, la bilharziose, les maladies respiratoires et les troubles intestinaux, pour ne citer que quelques exemples, sont tenus pour plus graves dans certaines régions

On s'accorde genéralement à reconnaitre que le pian prevaut surtout dans les regions relativement isolées, où le developpement economique et social est peu avance les conditions d hygiène assez primitives et la population essentiellement agricole

On n'a pas fait, en Afrique, de recherches systematiques sur le mode de transmission du pian ou sur sa periode d incubation mais selon l'opinion la plus communement admise, la propagation s'effectue principalement par contact direct Un certain nombre de territoires ont mentionné les mouches comme susceptibles de contribuer à la transmission de la maladie On n'a pas observé de cas d infection congenitale et la possibilité de contagion par voie sexuelle n'est signalee que par un petit nombre de pays

On est d'avis dans la plupart des pays, que le pian et la syphilis constituent deux maladies distinctes, la seconde étant plus repandue dans les grandes villes et spécia

usually absent While some territories reported that yaws and syphilis did not exist together in the same areas others stated the contrary, the author feels that in Uganda for instance, a study of small communities would probably show that one disease alone was present in any one community

lement dans les ports alors que le pian y est habituellement inconnu La coexistence possible du pian et de la syphilis dans une même region a eté admise par certains pays mais contestée par d autres l auteur estime pour sa part que l etude d une collectivite restreinte dans un territoire comme l Ouganda par exemple, amènerait probablement à conclure que ces deux maladies ne sévissent pas simultanement dans une même communaute

The author then considers two out breaks of yaws in mines in the Union of South Africa the first in the Turf Shaft Robinson Deep Mine in 1931, and the second in Springs Mines in 1942 In the former of the first 254 African cases 162 of the miners lived in the Turf Com pound and 92 in the Main Compound Although these 92 lived with other Africans who worked in another shaft and with surface workers only 8 of the other underground workers and none of the surface workers developed yaws This indication that the infection occurred underground is supported by the fact that 7 European miners working in the Turf Shaft also became infected while no cases occurred among Europeans in other shafts The shaft was some 8 000 feet (2 400 m) deep with an atmospheric-temperature range of approximately 87°-97°F (30 5 33 5°C) Water slime and rats were examined for *Treponema pertenue* without success The interval from the appearance of the primary lesions to the secondary eruptions must have been under 4 weeks since all miners were required to be weighed naked once a month and when yaws patients were thus recognized they usually had well developed secondary lesions These occurred on all parts of the body except the feet and ankles wh ch were covered at work The conclusion was drawn that transmission was by close bodily contact underground in the hot humid atmosphere

L'auteur décrit ensuite deux epidemies qui ont eclaté dans les mines de l Union Sud Africaine l une au Turf Shaft, Rob n son Deep Mine en 1931 l autre aux Springs Mines en 1942 Au cours de la première épidémie sur les 254 mineurs autoch tones atteints au debut 162 loga ent dans le Turf Compound et 92 dans le Main Compound Avec les 92 mineurs du Main Compound vivaient d autres Africains tra vaillant dans un puits d fferent ainsi que des ouvriers de surface huit seulement des mineurs de fond furent atteints et pas un seul des ouvriers de surface ne contracta le pian L infection s était donc propagee au fond de la mine ce qui est corrobore par le fait que 7 mineurs européens occupes dans le Turf Shaft furent également infec tes alors qu aucun cas de malad e n a été constate chez les Européens affectes à d autres puits Le Turf Shaft a quelque 2 300 mètres de profondeur et la tempéra ture de l air atmosphérique atteint de 30 5 à 33 5°C On n est pas parvenu à decouvrir *Treponema pertenue* dans l eau dans la boue ou chez les rats L intervalle entre l apparition des lesions primaires et secon daires doit avoir eté de moins de quatre semaines car tous les mineurs sont obliges de se faire peser devêtus chaque mois et ceux d entre eux chez qui le pian a ete observe à l occasion de ces pesees presen taient habituellement des lesions secon daires caractérisées ces lésions ont été observees sur toutes les parties du corps, à l exception du pied et de la cheville qui demeurent couverts pendant le travail On en a conclu que l infection se transmet par contact physique direct dans la chaleur humide qui règne au fond de la min-

Despite the precautions taken the incidence of yaws rose considerably the total number of cases for 1931 amount

En depit des précautions prises l épi demie s accrut considérablement et le nombre total de malades atteignit 338 en

ing to 338 A number of chemotherapeutic courses were tried, including neoarsphenamine and intramuscular bismuth sodium tartrate injections, the results obtained with the various courses of therapy are discussed

The second outbreak, in Springs Mines occurred in the very hot and humid conditions of No 4 Shaft some 7,000 feet (2,100 m) below ground The outbreak was well established when it was recognized, and fortnightly examinations were at once held at which most new cases were identified All yaws patients were isolated and treated until non infective The transfer of some miners from No 4 Shaft led to occasional cases among underground workers in other shafts, and one case occurred in a surface worker who had previously worked in No 4 Shaft

As in the first outbreak, the primary lesions occurred on all parts of the body except the feet and ankles, which were protected Transmission again appeared to be by direct skin contact and infection of some minor skin lesion In view of the fortnightly examinations, it was thought that the time between the appearance of the primary lesion and the secondary eruption was perhaps as short as 14 days

The treatment schedules adopted in this outbreak are also discussed in some detail

The author concludes that the following four factors were needed for the transmission of yaws among the African miners the presence of the treponeme, a favourable climate, skin injuries and close bodily contact He considers that there is no obvious reason why the same factors should not also be the most important in all yaws-endemic areas

In the concluding section, the author briefly reviews the yaws situation in Africa From the answers received to the questionnaire, he suggests that endemic syphilis may occur on the fringes of the yaws zone and considers that the question might

1931 Plusieurs traitements chimiothérapiques furent essayés, y compris l'administration de neoarsphénamine et les injections intramusculaires de tartrate de bismuth et de sodium, l'auteur examine les résultats obtenus avec ces médications

La seconde épidémie, celle des Springs Mines, a surgi dans l'atmosphère humide et chaude du puits N° 4, à quelque 2 150 mètres de profondeur L'épidemie était déjà en plein développement au moment ou elle fut decouverte, et des examens bimensuels immédiatement institués permirent de depister la plupart des nouveaux malades. Tous les mineurs atteints du pian furent isolés et traités jusqu'à disparition de la contagiosité Le déplacement d un certain nombre de mineurs du puits N° 4 a provoqué quelques cas isolés de maladie chez les travailleurs du fond dans d'autres puits, l'infection a été décelée en outre chez un ouvrier de surface qui avait précédemment travaillé dans le puis N° 4

Tout comme lors de la première épidémie, on a observé des lésions primaires sur toutes les parties du corps, à l exception des pieds et des chevilles qui sont protégés pendant le travail Cette fois encore, la contagion paraissant due à des contacts cutanés directs et à l'infection de légères abrasions cutanées Etant donne que les mineurs etaient examinés tous les quinze jours, on a admis que l intervalle entre l apparition de la lésion primaire et de la lésion secondaire ne dépassait peut-être pas deux semaines

Les schémas de traitement appliqués lors de cette épidémie sont analysés de façon detaillee

L'auteur conclut de ces observations que les quatre facteurs suivants sont nécessaires à la transmission de la maladie presence du tréponème, climat favorable traumatismes cutanés et contact physique étroit A son avis, il est extremement probable que les mêmes facteurs jouent un rôle prépondérant dans toutes les régions d endémie pianique

La dernière partie de l étude est consacrée à un bref aperçu des conditions que rencontre le pian en Afrique Se basant sur les réponses au questionnaire, l'auteur indique que la syphilis endémique se rencontre parfois à la périphérie des territoires

be made the subject of a useful study He also indicates that, in view of their importance, palmar and plantar lesions should be carefully investigated, and that more should be known of the proportion of yaws lesions at the various stages of disease in relation to any treatment a community has received Further study is also needed of the localization of lesions and of their relation to vegetation and insects, as well as of the time *T pertenue* can survive away from the body

Considering the seasonal incidence of yaws to be due to relapses rather than to new infections, he points out that this fact must be taken into account in assessing the importance of survey findings

Finally, he calls attention to the urgent need for thorough scientific investigation of yaws with the compilation of reliable and comparable data in order both to control the disease effectively and to provide valuable experience which could be drawn upon in the control of other diseases

ou sevit le pian, et fait remarquer qu il pourrait etre judicieux d etudier cette question Il souligne également qu'il y aurait lieu d entreprendre des recherches approfondies sur les lesions palmaires et plantaires en raison de leur importance, et qu'il conviendrait de recueillir des donnees plus complètes sur la proportion des lesions pianiques aux divers stades de la maladie selon le traitement qui a ete appliqué dans une collectivité donnee Il faudrait aussi étudier plus à fond la localisation des lesions et le role que la végétation et les insectes peuvent jouer à cet égard ainsi que la duree de survie de *T pertenue* hors de l'organisme humain

Les variations saisonnières de fréquence du pian sont dues, de l avis de l'auteur, a des récidives plutôt qu à des infections nouvelles, ce dont il importe de tenir compte dans l interpretation des resultats des enquêtes

L'auteur insiste, pour terminer, sur la necessité d une étude scientifique du pian qui s accompagnerait de la reunion de données sûres et comparables Ces travaux, non seulement permettraient de combattre efficacement cette maladie mais comporteraient également des enseignements féconds pour lutter contre d'autres maladies

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LE PIAN DANS LES TERRITOIRES AFRICAINS FRANÇAIS *

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INCIDENCE DU PIAN DANS LES RÉGIONS D'ENDÉMICITÉ

Ce rapport ne concerne que les territoires situes en Afrique occidentale et equatoriale et dependant du Ministere de la France d Outre Mer Dans les autres territoires africains français, c est a dire l'Afrique du Nord le pian est rarissime ou pratiquement inconnu Il en est d ailleurs de meme en Côte des Somalis, seule exception parmi les territoires administres par le Ministère de la France d Outre Mer, où l'on a signale seulement 2 cas en 1949, 2 cas en 1950, et où l indice pianique est à peine de 0 004 par rapport a la morbidite generale En effet, les climats secs et pre desertiques les sols sablonneux, ne conviennent pas au pian qui est par prédilection comme on va le voir, une affection des zones humides et forestieres

Afrique-Occidentale Française

Les statistiques de la Direction generale de la Sante publique four nissent pour l incidence du pian les chiffres indiques dans le tableau I Ces statistiques basees sur les donnees des consultations fixes et des hôpitaux, doivent être comparees avec les donnees du Service d Hygiene

TABLEAU I INCIDENCE DU PIAN EN AOF

Année	Habitants	Consultations	Pianiques	Pourcentage de pianiques	
				par rapport à la population	par rapport à la morbidité totale
1949	16 584 000	6 170 996	174 056	1	2 8
1950	17 153 000	5 796 914	2[illegible]0 913	1 2	3 8

D après la Direction générale de la Santé publique

* Ce travail a été rédigé à l aide des rapports non publiés et des statistiques communiqués par la Direction du Service de Santé de la France d Outre-Mer et les Directions de Santé publique en Afrique Française

mobile et de Prophylaxie, qui resultent des prospections effectuees dans les villages D'apres ce service, on a depiste 120 000 pianiques nouveaux en quatre ans (1947-50) sur 3 750 000 habitants visites, soit un indice pianique de 4% pour les quatre ans, ou un indice annuel de 1% Ce chiffre, on le voit, est comparable a celui que fournissent les consultations et les hôpitaux

Toutefois, il faut remarquer que les chiffres fournis par les prospections concernent seulement les sujets qui souffraient de lesions pianiques florides au moment où l'equipe medicale est passee dans le village Or, on sait que les lésions florides disparaissent souvent spontanément en 2 ou 3 mois On a remarque que, lorsqu'on visite un village tous les trois mois on y trouve chaque fois a peu pres le meme nombre de cas de pian floride – mais il ne s'agit plus des memes individus Pour avoir un indice annuel du pian en evolution dans une population donnee, il faut donc multiplier par 4 le nombre de cas de pian depistes au moment de la prospection, ou, mieux, adopter pour l'annee l'indice calcule sur 4 ans (Jonchere)

Ainsi, dans les zones rurales ou fonctionne le Service general d'Hygiène mobile et de Prophylaxie, l'indice pianique annuel pour l'ensemble des territoires de l'AOF serait de 4% environ, chiffre nettement superieur a l'indice etabli par les medecins des postes fixes, qui etait de 1,2% pour l'année 1950

TABLEAU II INCIDENCE DU PIAN DANS LES TERRITOIRES DE L'AOF EN 1950

Territoire	Population	Morbidité totale	Pianiques	Pourcentage de pianiques		
				par rapport à la population	par rapport à la morbidité totale	par rapport à la population visitée en tournées
Côte d'Ivoire	2 126 000	1 424 070	135 429	6,3	9,5	7,76
Guinée	2 262 000	621 719	30 281	1,3	4,9	3,76
Dahomey	1 540 000	501 860	22 262	1,4	4,4	2,20
Haute Volta	3 129 000	621 430	18 006	0,5	2,8	2,40
Soudan	3 337 100	1 036 815	12 889	0,3	1,2	1,04
Sénégal	2 102 000	1 205 381	1 279	0,06	0,1	0,20
Mauritanie	532 000	101 887	274	0,05	0,2	—
Niger	2 125 000	285 000	493	0,02	0,1	0,20

La répartition de l'endemie pianique en AOF est d'ailleurs tres inegale non seulement selon les divers territoires consideres, mais encore, à l'interieur de chacun de ces territoires, selon le climat et la physiographie

Le tableau II indique l'incidence du pian en AOF selon le territoire et permet de comparer l'indice pianique par rapport à la population totale

avec l'indice pianique établi par rapport à la population visitee en tournees dans les deux cas on constate la même gradation descendante depuis la Cote-d'Ivoire jusqu'aux territoires sahéliens L'indice obtenu par les tournées de depistage est plus eleve, parce que les equipes operent surtout dans les regions où l'on sait deja que l'incidence du pian est assez forte *Les divers territoires peuvent être classes de la façon suivante*, d'apres le degre d'endemicite

zone de faible endemicite	Niger Mauritanie Senégal
zone de moyenne endemicite	Soudan Haute Volta Dahomey
zone de forte endemicite	Guinee
zone d hyperendemicite	Côte-d Ivoire

Influence du climat et de la physiographie

Toutes les observations sur l influence du climat dans la distribution de l endemicite sont concordantes La zone de faible endemicite comprend les territoires sablonneux du Senegal et du Niger avec toute la region sahelienne Au Niger, les cas de pian observés sont le plus souvent importes de la Cote de l'Or Les cas de pian chez les autochtones ne s'observent que dans les regions traversees par le fleuve Niger et de climat plus humide que l ensemble du pays En Mauritanie, c'est egalement le long du fleuve (le Senegal) que l'on observe le pian, ou encore chez des sujets venant du Soudan, mais jamais dans les regions du nord, zones de savane sèche Au Senegal, le pian n'est endemique — et encore faiblement — que dans le sud, plus humide, et surtout en bordure de la Guinee Portugaise et de la Guinee Française, pays de forte endemicite, d'où proviennent de nombreux cas

La zone de moyenne endemicité comprend la region soudanaise, avec la Haute-Volta et le Nord Dahomey Au Soudan même, la plupart des cas s'observent dans les cercles du sud, de climat plus humide En Haute Volta, les pianiques sont nombreux surtout dans le cercle de Gaoua plus boise, où les pluies sont mieux reparties dans le courant de l annee et plus particulierement dans la partie de ce cercle qui touche à la Cote d'Ivoire Au Dahomey, seul le nord du pays appartient à la zone de moyenne endémicite . le climat est soudanais, avec des ecarts de temperature assez accentues, de larges variations du degre hygrometrique, et des chutes de pluie limitees à une saison très nette, en dehors de laquelle il n'y a aucune precipitation pendant plusieurs mois

La zone de forte endémicite comprend la savane boisee du Bas Dahomey et la region montagneuse et boisee de Guinee Le climat du Bas-Dahomey

est caracterise par une temperature et un degre hygrometrique constamment eleves, avec des chutes de pluie abondantes reparties en deux saisons En Guinee, la region du pian est par excellence la region forestiere qui fournit pres de la moitie des cas observes dans le pays, malgre la faible densite de la population, la difficulte d acces aux villages et la paresse des habitants a se presenter a la consultation Le climat est humide, les pluies tres abondantes (2 300 mm)

La zone hyperendemique est la forêt dense, basse et humide de la Côte d Ivoire En Cote d'Ivoire, on peut distinguer trois zones qui se presentent chacune sous un jour particulier une zone cotiere de savane boisee avec une incidence pianique de 4%, la zone forestiere de l interieur, de vegetation dense, qui reçoit 2 000 mm d'eau par an, et qui a une incidence pianique de 6 a 10% et davantage, une zone de savane a vegetation clairsemee, recevant 1 200 mm de pluie par an, avec une incidence pianique de 1% en moyenne On note une seule exception où l'indice pianique ne semble pas lie a la forêt humide c'est le cercle de Bouaké situe en zone de savane, où cependant l'incidence atteint 7,53% (1950) Mais cette region est enclavee dans la forêt, entouree de zones tres infectees, et constitue en outre la zone de transit inevitable entre la foret et la savane

En definitive, l'endemie est preponderante dans les regions chaudes, humides, a vegetation dense, a precipitations abondantes réparties sur toute l'annee ou tout au moins sur deux saisons Les foyers d'endémie pianique les plus actifs se trouvent dans les forêts, sur les terrains alluvionnaires de formation recente, dans les marecages, sur les bords des lagunes, le long des principaux cours d'eau Les zones laterítiques sont dejà moins atteintes L'apparition des acacias, des epineux, des palmiers «doum», des «craw craw», marque la limite de l'endemicité Les régions sablonneuses pre desertiques sont indemnes les cas importes n'y ont pas tendance à la diffusion, comme si le treponeme n'y trouvait pas les conditions favorables a son developpement

Influence de la densité de la population

Les rapports entre le pian et la densite de la population sont moins nets, et sujets à discussion Dans les régions de savane (sauf les savanes à climat soudanais marque) ou la population est dense, on signale de nombreux cas de pian Mais il faut remarquer que ces régions sont plus accessibles, que le niveau de vie est meilleur, les formations sanitaires plus nombreuses, le total des consultants plus eleve On observe des «taches» pianiques où le nombre total de malades par village et par famille est assez impressionnant

Dans les zones forestieres, la physionomie est differente La population est certainement moins dense au kilometre carre, les villages sont

difficilement accessibles, les formations sanitaires sont moins nombreuses et les tournees moins fréquentes L'endémie pianique se manifeste par des chiffres moins eleves, mais au lieu de s'observer par taches, elle est partout, elle atteint la totalité des familles et des villages (forets de Guinee et de Côte d'Ivoire) En AOF, il ne semble donc pas qu'un indice pianique eleve soit forcément lie à la densite de la population

Influence des saisons

L'influence des saisons est loin d'etre evidente Tandis que certains medecins signalent une recrudescence des cas de pian aux consultations, pendant la saison des pluies, d'autres au contraire constatent, pendant les memes mois, une diminution du nombre des consultants et l'attribuent justement aux grandes pluies En fait, s'il est vrai que le nombre des consultants pour pian est plus eleve à une certaine epoque de l'annee, l'augmentation porte aussi sur le nombre total des consultants pour toutes maladies, et ce phenomene semble en rapport avec le cycle des cultures le paysan se présente plus volontiers à la consultation lorsqu'il a termine ses travaux

Incidence du pian selon l'age

Dans les dispensaires et aux diverses consultations, les malades atteints de lesions pianiques se repartissent generalement de la façon suivante

0 à 1 an	2%
1 à 5 ans	12%
au-dessus de 5 ans	86%

Dans ce dernier groupe, ce sont les enfants de 5 à 10 ans et les adultes jeunes qui sont le plus frequemment atteints

Chez le jeune enfant, on observe quelquefois le pian primaire, chez l adulte, pratiquement jamais L'appellation de pian primaire est reservee au chancre non papillomateux, ulcereux ou plus rarement papuleux Son diagnostic differentiel est assez difficile, ce qui explique en partie la rarete des observations L'eruption de pianomes classiques, papillomes vege tants et suintants, se classe dans la periode secondaire

Le pian secondaire s'observe très souvent chez les enfants d age scolaire, les adultes jeunes et les adultes plus ages Les lesions florides ne sont pas rares chez le nourrisson et se rencontrent frequemment chez l enfant de 2 à 12 ans Dans certains territoires (Dahomey) il arrive que les malades attendent la période floride pour venir consulter la croyance veut en effet que le pian traite avant d etre « mûr » recidive plus souvent

Dès le début de la periode secondaire apparaissent les lésions palmo plantaires, les aires circulaires de desquamation sont très nettes chez les très jeunes enfants On constate aussi des plaques squameuses et érythemato

squameuses psoriasiformes, qui peuvent evoluer vers les kératoses ponctuees palmo plantaires L'hyperkeratose plantaire physiologique ou pathologique se complique de fissures et de rhagades, entre les lèvres desquelles peuvent sortir les pianomes très douloureux, rendant la marche très penible Ces lesions sont frequentes chez les enfants de 2 à 12 ans Les adultes chez lesquels on observe plus rarement l'éruption de pianomes plantaires, souffrent neanmoins de cette keratose considerable, formant un bloc épais parcouru de profondes rhagades entamant un derme enflammé et saignant facilement

Les lesions articulaires et osteo periostiques sont souvent contemporaines de la periode secondaire et peuvent être classees secondo-tertiaires Elles se rencontrent de préference dans le jeune âge lorsque le squelette est en pleine croissance (tibias en lame de sabre, spina-ventosa des phalanges)

Les lesions tertiaires tardives sont pratiquement inconnues Le goundou ne s'observe qu'à l'âge adulte et très rarement Le gangosa de l enfant ou de l'adulte ne peut pas être rattache au pian avec certitude C'est, d'ailleurs, une lesion de plus en plus exceptionnelle, même dans les regions ou l'indice pianique se maintient relativement eleve

Incidence du pian selon le sexe

Les deux sexes paraissent egalement sensibles à la maladie Si le nombre des jeunes garçons pianiques l'emporte parfois sur celui des filles, cela doit tenir a la plus grande fréquence chez eux des affections cutanees susceptibles d etre infectees par le treponème Chez les adultes, par contre les femmes sont plus souvent atteintes ou reinfectees, après perte de l immunite, parce qu'elles vivent en contact plus intime avec les enfants plus souvent porteurs de lesions transmissibles Toutefois et surtout dans les territoires musulmans, les femmes repugnent souvent à se presenter aux consultations et sont en outre plus occupees que les hommes, ce qui fausse d'autant les statistiques

Afrique-Equatoriale Française

Les statistiques du Service de la Sante publique fournissent les resultats indiques dans le tableau III De son [illegible] d'Hygiène mobile et de Prophylaxie donne le re[illegible] visitees en 1951, on a depiste 6 953 cas de [illegible] 0,5% Ce chiffre assez faible s'explique [illegible] ée ont porté sur des territoire[illegible]

Tout comme en A[illegible] est très inegale, elle [illegible] physiographie

TABLEAU III INCIDENCE DU PIAN EN AEF

Année	Hab tants	Consu tat ons	P an ques	Pourcentage de p an ques	
				par apport à la populat on	par rapport à la mo b d té totale
1949	4 407 000	1 639 987	90 7?6	2	5 5
1950	4 47 000	1 680 386	81 665	1 8	4 8

D après la D rect on générale de la Santé publique

Le tableau IV montre l incidence du pian en AEF en 1950 dans chaque territoire D après leur degre d'endemicite, ces quatre territoires peuvent être classes comme suit

one de faible endem cite	Tchad
one de moyenne endemicite	Moyen Congo
zone de forte endemicite	Gabon
et d hyperendémicite	Oubangu Chari

TABLEAU IV INCIDENCE DU PIAN DANS LES TERRITOIRES DE L AEF EN 1950

Terr to re	Populat on	P an ques	Pou centage de p an ques	
			par rapport à a popu at on	par rapport à a mo b d té tota e
Gabon	439 000	19 115	4 3	8
Moyen Congo	695 000	24 820	3 2	4
Oubangui Chari	1 087 000	35 079	3 2	7 2
Tchad	2 250 000	2 651	0 1	0 8

Influence du climat et de la physiographie

La zone de faible endemicité comprend les territoires sablonneux, saheliens, ou le climat est sec (Tchad)

La zone de moyenne endemicite comprend les territoires de savane les galeries forestières, à l exclusion de la forêt dense

La zone de forte endemicite et d hyperendemicité comprend les territoires de forets denses et humides, les plaines marecageuses de l Oubangui Chari Encore une fois, comme en AOF, le climat, et particulièrement le degre hygrometrique, imprime à l endemie un caractère special L influence de la plaine marecageuse de la forêt dense et humide ne fait pas

de doute Il n'est pour s'en convaincre que d'examiner les chiffres du tableau V.

TABLEAU V. INCIDENCE DU PIAN EN AEF SELON LE TERRITOIRE ET LA PHYSIOGRAPHIE

Territoire	Physiographie	Habitants visités	Indice pianique par rapport à la population visitée (%)
Moyen Congo	Forêt	103 523	1 3
	Savane	292 676	1 5
Gabon	Forêt	90 090	0 7
	Savane	54 849	0 ?
Oubangui Chari	Marécage	27 542	3 1
	Forêt	48 786	0 5
	Savane	150 688	0 2
Tchad	Savane	186 428	0 1

Influence des saisons

L'*impression generale est que les poussees pianiques sont* plus nombreuses pendant la saison des pluies

Incidence du pian selon l'âge

En Afrique-Equatoriale Française, les enfants representent un très fort pourcentage du total des pianiques

On a trouve

au Moyen Congo	5 390	enfants pour	7 302	pianiques	soit	73 8%
au Gabon	579	» »	814	»	»	71,1%
en Oubangui Chari	681	» »	1 521	»	»	44 8%
au Tchad	244	» »	425	»	»	57,4%

Les lesions primaires sont rarement observees Même les enfants ne sont presentes à la consultation qu'en pleine periode secondaire Chez les adultes, la forme hyperkeratosique predomine

Incidence du pian selon le sexe

Par rapport au nombre total des adultes pianiques dans chaque territoire, le pourcentage des femmes est le suivant

Moyen Congo	66,5 %	(sur 1 912 adultes)
Gabon	68,94%	(» 235 »)
Oubangui Chari	36,20%	(» 840 »)
Tchad	54,70%	(» 161 »)

Les deux territoires qui fournissent le plus faible pourcentage de femmes pianiques sont les plus islamisés.

Togo (Administration française)

Le tableau VI indique les résultats fournis par les statistiques des trois dernières années.

TABLEAU VI. INCIDENCE DU PIAN AU TOGO FRANÇAIS

Année	Habitants	Consultations	Pianiques	Pourcentage de pianiques	
				par rapport à la population	par rapport à la morbidité totale
1948	763 000	803 919	74 469	9,7	9,2
1949	982 000	904 409	82 767	8,4	9,1
1950	939 000	1 087 212	116 541	11,67	10,7

Influence du climat et de la physiographie

Ici encore, l'endémie pianique sévit surtout en zone de forêt dense. Le foyer le plus actif coïncide avec la forêt de l'Akposso, située dans la région montagneuse du centre, à une altitude moyenne de 800 mètres, coupée de vallées humides, fertiles et peuplées. L'incidence pianique va en diminuant vers le nord, à mesure que la savane se fait de plus en plus clairsemée.

Les relations du pian avec la végétation apparaissent nettement dans le tableau VII.

TABLEAU VII. POURCENTAGE DE PIANIQUES AU TOGO FRANÇAIS SELON LA RÉGION ET LA VÉGÉTATION *

Savane			Forêt		
Cercle	Pourcentage de pianiques		Cercle	Pourcentage de pianiques	
	par rapport à la population visitée	par rapport à la morbidité totale		par rapport à la population visitée	par rapport à la morbidité totale
Mango	0,11	1,52	Atakpamé	2,52	11,1
Lama Kara	0,01	5	Palimé	2,40	7,5
Sokodé	0,4	4	Anécho	1,3	10

* Les pourcentages indiqués dans ce tableau et le suivant ont été obtenus à la suite de prospections différentes.

A l'interieur d'une même circonscription administrative, on observe également cette variation de l'indice selon le developpement de la vegetation Le tableau VIII met en lumière la difference de l'indice pianique selon la végetation à l'interieur des deux circonscriptions de Palime et d'Atakpame

TABLEAU VIII POURCENTAGE DE PIANIQUES DANS UNE MÊME RÉGION ADMINISTRATIVE DU TOGO FRANÇAIS SELON LA VÉGÉTATION

Cercle	Savane		Forêt	
	Pourcentage de pianiques		Pourcentage de pianiques	
	par rapport à la population visitée	par rapport à la morbidité totale	par rapport à la population visitée	par rapport à la morbidité totale
Palimé	1 73	0 8	3 55	18
Atakpamé	2 20	10	3 00	22

Influence de la densite de la population

La densite de la population a peut être quelque influence sur l intensite de l endemie pianique en certains secteurs du pays En particulier, le secteur de Lama Kara, avec 60 habitants au km", est plus fortement atteint par l'endemie que les regions voisines moins peuplees De même, dans la [illegible] ndice pianique [illegible] faible densite

Influence des saisons

Les variations de l incidence pianique selon les saisons semblent négligeables au Togo français

Incidence du pian selon le sexe

Les deux sexes semblent à peu pres egalement touches par le pian

Cameroun (Administration française)

Les donnees statistiques pour les quatre annees 1948 51 figurent dans le tableau IX

Influence du climat et de la physiographie

Comme dans les autres territoires, le pian, au Cameroun, est cantonne dans les zones forestieres et les regions basses, marecageuses, ou la temperature et l'humidité sont constantes et elevees A l'interieur meme des circonscriptions où existent des zones de forêts et des zones de savane

TABLEAU IX INCIDENCE DU PIAN AU CAMEROUN FRANÇAIS

Année	Hab tants	Consu ta ons	P an ques	Pou centage de p an ques	
				par rapport à la popu at on	par rapport à la mo b d é totale
948	2 341.000	1 343 202	146 757	6 1	11
949	3 006 000	1 335 ^01	168 280	5 5	12 6
950	3 006 000	1 421 004	162 555	5 4	1 4
95	3 060 635	1 430 004	172 694	5 6	1 3

la morbidite pianique predomine nettement dans les zones de forets humides et chaudes *La zone de plus faible endemicité est la région du* Nord Cameroun de climat soudanais avec 98 pianiques pour 769 527 habitants et un indice pianique de 0 01 % par rapport à la population de 0 14 % par rapport à la morbidite genérale La zone de plus forte endemicite est la region de Kribi maritime et forestiere avec 15 802 pianiques pour 48 620 habitants soit 32 5 % par rapport a la population et 14 8 % par rapport à la morbidite genérale

Entre ces deux extremes tous les intermediaires existent en fonction du site physiographique et de la temperature Seule parmi les regions

capitale Douala Le niveau de vie plus eleve des habitants leur évolution sociale la plus grande facilite de traitement n ont pas manque de corriger l influence du climat

Influence de la densité de la population

Au Cameroun les regions de forte densite de population sont en général indemnes de pian mais la raison en est que ces regions se trouvent dans les zones de climat sec

Influence des saisons

Les medecins observent une recrudescence des consultations pour pian pendant la saison des pluies Mais cette difference d une saison a l autre n est pas comparable à celle que l on observe en passant d une region relativement seche à une region de pluies abondantes

Incidence du pian selon l age

La lesion primaire est souvent constatee chez les nourrissons au niveau des lèvres Les enfants au dessous de 4 ans ont fourni en 1951 un pour

centage de 10% de tous les cas de pian secondaire (18 280 cas) Le maximum de lesions primo secondaires s'observe à l'âge scolaire Des cet âge, on note parfois les lesions palmo plantaires de la periode secondo-tertiaire Celles ci sont egalement fréquentes chez les adultes, qui presentent le plus souvent des lesions secondaires

Incidence du pian selon le sexe

En 1951, on a compte, pour 172 694 pianiques, 92 250 malades du sexe masculin, soit 53,4%, et 80 444 du sexe feminin, soit 46 6% Chez les enfants, la maladie semble egalement repartie entre les deux sexes

TABLEAU CLINIQUE DU PIAN EN AFRIQUE

En etudiant l'incidence de l'infection a ses divers stades, il ne faut pas oublier que, dans les territoires consideres, le depistage est tres souvent effectué par des auxiliaires Ceux-ci ne sont pas toujours capables de faire un diagnostic differentiel dans les cas de lesion primaire, par exemple Par contre, dès qu'ils sont informes de l'existence d un pian plantaire, ils ont tendance a qualifier de pianiques toutes les fissures et erosions de la sole plantaire, ce qui augmente le nombre de cas signales comme secondo tertiaires ou même tertiaires

Les lesions primaires s'observent rarement, en partie a cause de la difficulte du diagnostic, surtout dans ces regions où abondent toutes sortes de lesions ulcereuses tegumentaires Les lesions primaires siègent de preference aux membres inferieurs (95% des accidents primaires depistes) On attribue cette localisation au fait que les legers traumatismes sont plus frequents dans cette partie du corps, et favorisent l'introduction du treponème Le chancre d'inoculation se voit assez souvent a la levre des jeunes enfants, sans doute parce que ceux ci portent volontiers à leur bouche tout ce qui leur tombe sous la main y compris les linges souilles par les secretions des lesions pianiques (1% des accidents primaires) Les meres ayant perdu leur immunite font assez souvent des recidives au sein ou aux hanches apres contamination par la bouche ou les cuisses de leur enfant infecte

Parmi les lesions secondaires, le pianome framboesiforme s'observe frequemment Souvent il est generalise quand le malade se presente à la consultation

Les lesions palmo plantaires, que presente environ le quart des consultants, peuvent s'observer aux deux periodes, secondaire et tertiaire Le pian crabe, sous sa forme de pianome framboesiforme emergeant entre les lèvres d'une fissure plantaire, est très frequent, surtout chez les enfants d'âge scolaire Mais ce n'est pas le seul aspect clinique palmo-plantaire

en meme temps que les pianomes on note des lesions papulo squameuses circulaires limitees par une fine collerette de vesicules b en visibles chez les jeunes enfants à peau fine

Les lesions d hyperkératose surviennent le plus souvent apres une periode de latence consecutive à l éruption floride des pianomes Elles sont nettement secondo tertiaires ou tertiaires La forme plantaire à fissu ration douloureuse est classique

Aux mains la peau est fripee rugueuse la paume se desquame en larges bandes la main prend la forme d une sébile apres retraction de la racine des doigts La gêne fonctionnelle est souvent importante

Les manifestations articulaires et osseuses sont fréquentes Les arthrites affectent le plus souvent la forme seche Les lesions du type spina ventosa ne sont pas rares Les phalanges le tibia et le radius sont les os les plus generalement atteints Ces osteites sont plus précoces et relativement nombreuses dans certains foyers (sud du Togo sud du Dahomey) Ailleurs elles sont plus tardives et vraiment « tertiaires » Quant aux dou leurs osteocopes on les attribue indifferemment au pian ou a la syphil s

Les autres formes du pian semblent tres rares On ne signale po nt de localisations viscerales ou sur les organes des sens Le « pian nerveux » n est connu en AOF que par une observation peu convaincante de Botreau Roussel[a] au sujet d un habitant de Cote d Ivoire qui presentait des symptômes du type paralysie genérale En fait la coexistence de la syphilis et du pian dans les memes régions ne permet pas de rapporter au pian à coup sûr les accidents observes Le pian congen tal n a jamais ete cons taté Les nodosités juxta articulaires particulièrement au Senegal sont géneralement rapportees au pian

Le goundou s observe de plus en plus rarement du moins sous sa forme faciale paranasale spectaculaire Les hyperostoses portant sur d autres os que ceux de la face ne sont pas toujours rattachees au goundou Pourtant de 1915 a 1917 Botreau Roussel avait rassemble 117 cas de goundou en Cote d Ivoire dont 95% affectaient le massif facial Les patients éta ent peut etre attires à la consultation par l espoir d une opera tion chirurgicale qui etait pratiquée avec succes De semblables observa tions ne sont plus faites de nos jours quoique les services chirurg caux d Abidjan aient toujours fonctionne avec bonheur La rarefaction de la tumeur paranasale reste inexpliquée d autant plus que l indice p anique n a pas subi de diminution massive

Le gangosa est exceptionnel Son etiologie est certainement multiple et son évolution n est possible qu en l absence de tout soin et de toute hygiène conditions que l on ne rencontre plus guère

En bref la physionomie du pian dans les territoires africains français répond bien au schema classique Un seul symptôme non classique signale par Jonchère paraît mériter une mention speciale la frilosite extreme

[a] Botreau-Rou sel (917) *Bull. Soc Pa h exo* 10 480

des enfants atteints de pian généralisé, frilosité qui résulte peut être d un trouble du système neuro végétatif et du système endocrinien

IMPORTANCE PSYCHOLOGIQUE, ÉCONOMIQUE ET SOCIALE DU PIAN

Le pian n'est pas douloureux, du moins au début C'est surtout un mal inesthétique et souvent repugnant Il impressionne vivement le visiteur et ne se conçoit plus que dans certaines conditions d'inconfort, de promiscuité et de manque d'hygiène Mais il ne faut pas croire que ces conditions soient beaucoup moins fréquentes qu'autrefois

En effet si l'élévation du niveau de vie des populations africaines est évidente, elle se manifeste surtout autour des centres administratifs et commerciaux fondés par les Européens A partir de ces centres, et dans un rayon qui augmente avec le temps, l'incidence du pian est pratiquement nulle (C est ainsi que Douala au Cameroun est indemne de pian en pleine zone d'endémie) Mais il reste la « brousse », c'est a dire une proportion énorme de territoire où les conditions de vie sont restées inchangées depuis des siècles au point de vue vêtements, habitation, instruction et éducation sanitaire La différence est aussi grande aujourd'hui entre un Africain évolué rallié au mode de vie du blanc et un habitant d'un village de la brousse, qu'elle pouvait l'être il y a cinquante ans entre un autochtone d'Afrique et un Européen Plusieurs millions de ces autochtones sont encore exposés au pian par leur mode de vie

Les Africains savent d'ailleurs que l'affection n'est pas grave Ils savent aussi qu'elle est inévitable C'est pourquoi ils ne font pas toujours l'effort de se rendre à la consultation fixe, parfois éloignée de 5 à 10 km Le succès des thérapeutiques européennes est cependant connu de la majorité des habitants, et, en cas de tournée médicale, le pianique se présente volontiers au médecin Mais le traitement est alors réduit à un simple blanchiment, qui satisfait l'esthétique, sans réussir à empêcher l'évolution secondo-tertiaire, qui est vraiment douloureuse C'est pourquoi le pianique floride qui n'aura pas voulu se déplacer pour faire traiter le pian au stade de dermatose généralisée, se traînera avec peine jusqu'au médecin pour lui demander la guérison d'une ostéite ou d'un pian plantaire douloureux devenus résistants au traitement

L'indifférence trop fréquente du pianique au début tient pour une grande part au mépris de l'esthétique et au fait que le pian est considéré comme fatal et inéluctable Mais il y a des régions où les malades attendent très longtemps avant de consulter le médecin, parce qu'ils croient comme leur entourage, que seules les lésions arrivées au stade de maturité sont curables et que le risque de rechutes est alors minime

Quoi qu'il en soit, le pian primaire et le pian floride ne semblent guere troubler outre mesure la vie au village Certes, chacun a pu voir, accroupis, grelottants, ramenant sur eux pour tenter de se protéger une loque vestimentaire, de petits pianiques victimes d une poussée evolutive ou d une affection intercurrente Mais ce spectacle désolant en soi ne doit pas hisser le pian infantile à la hauteur d'une affection vedette Sauf peut être le pian crabe qui interrompt pendant son evolution les jeux de l enfant pianique, l affection cutanee secondaire n'apparait pas comme une cause de souffrance particulière dans le jeune âge Le pian primaire et floride fait partie des miseres considerees comme inevitables parmi ces populations resignees, fixées dans une existence traditionnelle

Il en va autrement dans la suite il est indeniable que le pian plantaire, avec ses lésions fissurees tardives, rebelles au traitement, les arthrites et osteites qui frappent souvent les adultes jeunes les plus actifs representent une cause reelle de souffrance qu il faut tacher d'eliminer

La perte economique qui resulte des indisponibilites dues au pian est certaine, mais il ne faut pas exagerer, ni evoquer à propos du pian les questions de main d œuvre et de rendement

En effet, le pian est pratiquement une maladie familiale qui sevit dans des milieux traditionnels relativement fermés et ayant conserve le mode de vie ancestral L unique activite des villages des zones endemiques est limitée aux cultures vivrieres, le plus souvent pratiquees dans un coin de foret defriché (manioc, taros, ignames, bananes), ou encore a une petite culture de cafe ou de cacao dont les produits servent « à acheter l argent » nécessaire a quelques besoins domestiques, habillement et paiement de l impôt Le pianique en evolution douloureuse peut être detourne pendant quelques jours ou quelques semaines de cette activite limitee la famille n en cultive pas moins le même champ, avec le même resultat malheureusement insuffisant

Des que la notion d'activite productrice intervient des qu il s agit d une véritable « exploitation », même modeste, le contact avec l exterieur s etablit et amène une frequentation plus reguliere des postes médicaux Dans les collectivites surveillees, par exemple, il n y a pratiquement pas de pian parmi les manœuvres, et la maladie se fait de plus en plus rare dans les familles, qui vivent « au village » en lisiere de l exploitation

Dans les territoires africains français tout au moins, d autres maladies ont une importance economique tres superieure à celle du pian L ulcere phagédenique, par exemple, représente certainement une cause plus grande d indisponibilité et d absentéisme Le paludisme et la bilharziose posent aux chefs d'entreprise des problèmes de prophylaxie beaucoup plus difficiles On est donc *mieux fonde, semble t il, à reclamer* des campagnes systématiques contre le paludisme, la trypanosomiase, la lepre, la bilharziose la syphilis le trachome, l'onchocercose Les indigenes eux memes ne s y trompent pas et paraissent evaluer assez exactement les dangers du pian

PARTICULARITÉS DES ZONES OU LE PIAN EST ENDÉMIQUE

Des observations qui précèdent se dégage une notion déjà classique : le pian est localisé dans les populations à développement économique et social retardé.

Ces populations souffrent également du paludisme, de diverses parasitoses sanguines et intestinales, particulières aux pays tropicaux, ainsi que de la malnutrition qualitative habituelle dans ces régions. On a parfois voulu voir dans ces diverses affections autant de causes qui favorisent l'incidence du pian. Rien ne semble prouver que cette hypothèse soit juste. Mais toutes ces maladies, et le pian également, sont le lot du « milieu » dans lequel vivent ces populations et qui se traduit par l'absence complète d'hygiène.

Il ne faut pas confondre cette absence d'hygiène avec la malpropreté, car l'Africain, même dans les villages les plus primitifs, prend régulièrement des soins de propreté corporelle. Par contre, ses vêtements sont généralement sales. A ce propos, bien que la nudité ait passé aussi pour une des causes favorisantes du pian, on notera que la maladie n'est pas plus rare chez les musulmans des Iles Comores qui portent des vêtements, que chez les fétichistes plus volontiers nus.

De même, si la malnutrition a été considérée comme un facteur d'endémicité, on connaît un foyer pianique important dans le cercle d'Abengourou où les habitants sont relativement aisés et bien nourris. Et inversement, le pourcentage de pianiques est faible dans la population de Ouahigouya où la nourriture est moins riche et moins abondante.

En somme, les diverses autres affections endémiques, l'absence de vêtements, la sous-alimentation vont de pair avec le pian, elles ne l'expliquent pas.

La densité de la population ne semble pas non plus jouer un rôle très net. Elle est très faible, en effet, dans les zones forestières où le pian est hyperendémique. On connaît cependant, dans des zones relativement sèches, des foyers pianiques dont l'activité pourrait s'expliquer par la densité de la population. Les choses se passent en somme comme si le pian se perpétuait « au foyer », comme dans son meilleur élément, dans les zones humides à population disséminée, et ne se maintenait en région sèche que grâce à la densité de la population qui multiplie les contacts humains.

La prédilection du pian pour les zones humides de fort degré hygrométrique est évidente, à quelques exceptions près. Il est difficile de savoir si le tréponème trouve là ses meilleures conditions biologiques de survie ou si l'endémie y est favorisée par les conditions antihygiéniques où vivent ces populations spécialement misérables.

Il est évident que les régions forestières sont plus primitives, moins parcourues, moins accessibles, et que la faible densité de la population

y fait retarder l installation de services sanitaires Mais il y a en Cote d Ivoire et au Cameroun par exemple, des zones forestieres ou les villages sont rassemblés le long des voies de communication, des routes aussi frequentees que dans les savanes seches, des dispensaires medicaux aussi nombreux, dans ces zones comme ailleurs les soins medicaux sont gratuits, la formule d'administration est la même, toutes les circonscriptions possèdent une ecole L'endemicite pianique n'en est pas moins une des plus fortes que l'on observe en Afrique, la clientele des postes medicaux com prend parfois 30% de pianiques

Quant aux ecoles, il ne faudrait pas en exagerer l importance S il est vrai que l'enfant qui frequente l'ecole est pratiquement sauve du pian c est surtout parce qu il appartient deja a un milieu evolue ou en voie d evolution et que son mode de vie le met desormais à l abri de la maladie Mais le pian se maintient justement dans les villages eloignes des centres, dans les regions où la creation d'ecoles est encore a l etat de projet

Quel que soit le rôle des conditions hygieniques et de la plus ou moins grande penétration europeenne, il semble bien que l'on ne puisse pas refuser au climat une influence favorisante tres nette dans la persistance de l endemie pianique

Les conditions de vie dans les regions sèches considerees comme plus ouvertes, mieux averties, relativement plus aisees, ne sont d ailleurs pas telles que le trachome ne s'y maintienne de façon desesperante Dans ce cas aussi l on invoque le climat, les poussières et surtout la mauvaise hygiene Pian en region humide, trachome en region seche apparaissent comme des temoins de cet inconfort domestique, qui permet la transmission à domicile de virus et parasites parfaitement adaptés au milieu local

MODE DE TRANSMISSION DU PIAN

Les mouches sont très souvent accusees de transmettre le pian indirecte ment Aucune preuve de leur action n a jamais ete relevee du moins en Afrique En Indochine le moucheron « conbo hong » est suspecte à cet egard, à la Jamaïque, Kumm a prouve le rôle de *Hippelates pallipes* mais en Afrique on n a rien observe de semblable La transmission par contact direct d homme infecté à homme sain reste la plus probable La contamina tion indirecte par les linges souilles est tres possible

La periode d incubation est generalement estimée à 3 ou 4 semaines Toutefois, Jonchère mentionne l'observation suivante qui prouverait une reduction de l incubation

« Il me souvient d un enfant d un an environ dont la mère meurt Cet enfant couvert de framboesias est adopté par une tante vivant dans un village voisin et qui a un enfant de quelques mois plus jeune La tante donne le sein aux deux enfants Elle presente un chancre d inoculation pénmamelonnaire dix huit jours après l adoption et son propre fils presente une lésion sous mentonnière huit jours après »

LA SYPHILIS DANS LES RÉGIONS D'ENDÉMIE PIANIQUE

De façon générale, la syphilis est assez également répartie dans toute l'Afrique et peut s'observer en particulier dans toute la zone où sévit le pian A l'intérieur de cette zone, elle est commune aussi dans les centres urbains où le pian est exceptionnel, cela doit tenir au mode de vie des citadins De même, dans les régions saheliennes pré désertiques, le pian est rare tandis que la syphilis est commune Mais dans les zones rurales de climat humide et chaud, pian et syphilis peuvent coexister partout, ce qui rend très difficile le diagnostic différentiel des ulcères, gommes et ostéites

Le Service général d'Hygiène mobile et Prophylaxie de l'AEF signale même des poussées simultanées de pian et de syphilis, et l'on imagine les difficultés du diagnostic laissé si souvent à des auxiliaires médicaux D'autre part, il n'est presque jamais signalé de syphilis primaire ou secondaire, ce qui ajoute encore à la confusion dans les observations et les statistiques Cependant, les autochtones semblent différencier les deux maladies

Au cours d'une enquête sérologique en AOF, le Dr Lapeysonnie a fait les constatations suivantes, en étudiant la réaction de déviation du complément au cours du pian évolutif Dans tous les cas de pianomes généralisés, de lésions palmo-plantaires, de goundou ou de nodosités juxta articulaires, il a obtenu 100% de réactions positives Dans les cas de pian cicatriciel 57%, et dans les cas de lésions cutanées suspectes, 37% de réactions positives, 44,8% de réactions douteuses

En brousse, il utilisait comme « réaction d'exclusion » la méthode de Kline et ses dérivés (VDRL, Kline-cardiolipine, Hinton, Mazzini) Il recommande comme réactions spécifiques les réactions de Kolmer standard Kolmer-cardiolipine, ou E P 50 cardiolipine

CONCLUSIONS

Il est indéniable que le pian sévit de préférence dans les régions chaudes, de degré hygrométrique élevé Son incidence atteint le maximum dans les zones de forêts humides, où, dans l'état actuel des choses, il représente pour les populations une véritable fatalité Certaines tribus pratiquent d'ailleurs l'inoculation volontaire aux enfants

Les régions de forte morbidité sont caractérisées, en outre, par la faible densité de population, le mode de vie primitif des habitants et leur ignorance absolue de la plus élémentaire hygiène

Le pian est généralement plus rare dans les régions sèches où la population est plus dense Quand il existe, il ne s'y répand pas en fonction de cette densité Et cependant le mode de vie et la connaissance de l'hygiène ne

sont pas tres differents dans ces regions ce que demontre la diffusion extreme du trachome autre témoin de l ignorance de la pauvrete et de la promiscuite

Le rôle du climat apparaît donc net dans la distribution du pian et dans la conservation de *T pertenue* dans la nature

Le pian primaire atteint de préference les enfants ce qui limite de façon appreciable la consequence economique des indisponibilites dues aux periodes douloureuses de la maladie

Les adultes peuvent presenter des lesions primaires temoins vraisemblables de la perte d immunite consecutive a l atteinte dans l enfance ou des les ons secondaires le plus souvent des rechutes au cours de l evolution chronique Ces lesions ainsi que les manifestations secondo tertiaires (p an palmaire plantaire ostéites arthrites) sont trop souvent l origine d absenteisme Mais dans l état present des regions d endemie où le travail a garde son caractere familial ces indisponibilites ne prennent pas un caractere trop sérieux Le fait que le pian n entraîne ni avortements ni les ons congénitales ou herédítaires limite encore l importance sociale de la maladie

Le réel intéret social du pian reside surtout dans le reflet fidele que la maladie nous donne du deficit hygienique des regions atteintes

Le pian répond très bien (au moins temporairement) a la therapeutique Son traitement heureux est un des meilleurs elements de propagande de la médecine *Les difficultes de penétration dans les zones endemiques* et le caractere primitif des populations ne sont pas tels que les habitants ne pu ssent être traites En territoire français en particulier il n y a pas un village qui ne soit visite au moins une fois par an

Et cependant l eradication de la maladie et meme la diminution du nombre des pianiques sont beaucoup plus lentes qu on ne pourrait le souhaiter et les résultats ne repondent pas aux espérances

Ce semi-échec tient a plusieurs causes 1) le reservoir d infection n est pas atteint dans sa totalite (cela prouve qu une campagne de prophylaxie doit porter sur l ensemble de la population) 2) le pourcentage des rechutes est certainement important apres un traitement insuff sant 3) et surtout les mod fications de l etat social et les progres de l education sanitaire ne sont pas comparables aux efforts d ordre purement med cal

La resistance de l affection temoigne de la facilite de transmission de *T pertenue* dans les conditions habituelles de la vie au foyer autochtone

Nos connaissances sont encore incomplètes sur quelques points (transmiss on indirecte rapport immunologique avec la syphilis interpretation des rechutes évolution viscerale eventuelle) Toutefois on peut affirmer d ores et dejà que du point de vue pratique le pian est plutot un probleme social qu un probleme medical Les etapes de sa disparition representent un des meilleurs critères des progres de l hyg ène publ que

ment, and since health education is still insufficient The author concludes that only the adoption of public health measures in endemic areas can gradually eliminate yaws

fréquentes après un traitement trop et que l éducation sanitaire est insuffisante L'auteur conclut que des mesures d hygiène publique da régions d'endémicité pourront gra ment faire disparaître le pian.

DISCUSSION : PART III

Chairman Dr Boon SUVANASARA
Rapporteur Dr K R HILL

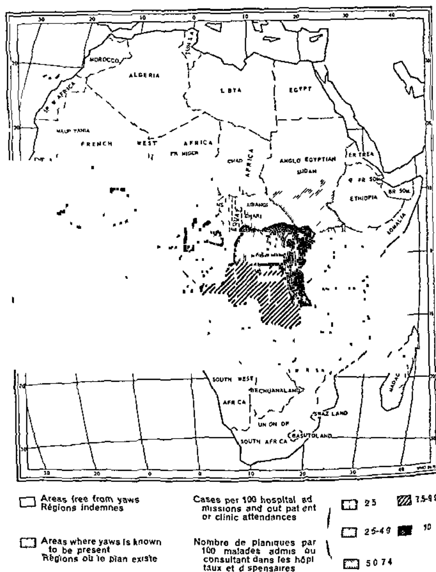
With regard to the extent of the yaws problem, it was pointed out that the available data were highly unsatisfactory All too often, reports were based on vague impressions or on incomplete population information, or were expressed in terms of percentages of yaws patients attending poli clinics and dispensaries For instance, in eastern Liberia, out of 6,000 patients attending a mission clinic, 5,000 were found to have yaws This could not be interpreted to mean that 80% of the population had the disease, but only that 80% of the clinic patients were infected The participants in the discussion were agreed that more adequate data would be highly desirable

In the Americas, yaws is found in the northernmost countries of South America, to only a very limited extent in Central America and most widely in certain of the Caribbean islands The disease is found in almost every State of Brazil, although it is not a major problem in the southern part of the country During 1948, the incidence of the disease was reported as 26 4 per 100,000 in British Guiana and as 413 per 100,000 in French Guiana In Surinam, the disease has decreased during the past quarter of a century, but it still persists in the central, heavily wooded parts of the interior Yaws is found in the rural areas of Venezuela and, to a lesser extent, in Colombia A few cases persist in Ecuador mostly along rivers and in rural areas along the Pacific coast Apart from Panama, which in 1948 had an incidence of 35 8 per 100,000, the disease rarely occurs in Central America In southern Mexico, the prevailing treponemal disease is not yaws but pinta, although occasionally a case of yaws is imported from Central America

No doubt the heaviest burden of yaws in this part of the world is in Haiti, where it constitutes a major health hazard Important reservoirs also exist in the Dominican Republic, Jamaica, and Tobago Some years ago, yaws was not uncommon in Cuba, Martinique, and Trinidad, but it has now largely disappeared from these and other Caribbean islands

The extent of the yaws problem in Africa has been dealt with in the preceding papers by Hackett and Vaucel Combining their data with other information available, it is possible to show graphically the estimated prevalence of the disease on this continent (fig 1)

FIG 1 PREVALENCE OF YAWS IN AFRICA, 1948-50
L'ENDÉMIE PIANIQUE EN AFRIQUE, 1948-50



In South-East Asia, yaws is particularly prevalent throughout the Indonesian archipelago and in the peninsula comprising Malaya, Thailand and the States of Indo-China In Thailand, the disease is most common in the southern and northeastern parts of the country , and in Indo China it occurs mainly along the coast and in the State of Laos

In India yaws is now confined to a belt of territory in the southern and central States, stretching from Madras State through Madhya Pradesh Hyderabad and Orissa , formerly the disease was also known in Malabar and Travancore Yaws also occurs in the forest areas of Assam In Burma it is rare, but a few pockets are known to exist in the interior of the country It has been almost completely eliminated from Ceylon although a few cases occur in the remote jungle areas of the interior

Yaws also exists in the western and southwestern Pacific area In the Philippines the southern islands of the archipelago (Samar, Leyte Min dinao) have the highest incidence of the disease A few cases have been reported among the aborigines in the eastern part of Taiwan and in the northern areas of Australia In the smaller islands of the Pacific yaws is highest in incidence toward the west and is particularly a problem in New Guinea, and in the Gilbert, Ellis and Solomon groups Further to the east, yaws gradually decreases so that in the Marquesas and the Tuamotu archipelagos it is no longer encountered

The tropical nature of yaws is an outstanding feature of its geographical distribution, since it occurs almost exclusively between the Tropic of Cancer and the Tropic of Capricorn (fig 2)

As to the nature of the problem it is clear that yaws is prevalent only in underdeveloped rural areas Many participants noted that yaws has declined with urbanization and with higher standards of living and educa tion Dr Huggins expressed this succinctly by stating that yaws occurs at the end of the road , roads being a symbol of socio economic progress

Many other speakers stressed the economic aspects of yaws control pointing out the vast importance of the disease, particularly among agri cultural and plantation populations where it was a major factor retarding economic development

DISCUSSION PARTIE III

President Dr Boon SUVANASARA
Rapporteur Dr K R HILL

Les donnees permettant de se faire une idee de l envergure du probleme du pian sont, de l avis general, tout à fait insuffisantes Trop souvent les rapports se fondent sur des impressions vagues des informations incom pletes relatives aux chiffres de population ou bien expriment le pourcentage de pianiques se présentant aux polichiniques ou dispensaires C est ainsi qu au Libéria, le pian fut diagnostique chez 5 000 des 6 000 malades qui s etaient présentes au dispensaire de la mission Cela ne signifie pas que 80% de la population soit atteinte de pian mais simplement que 80% des

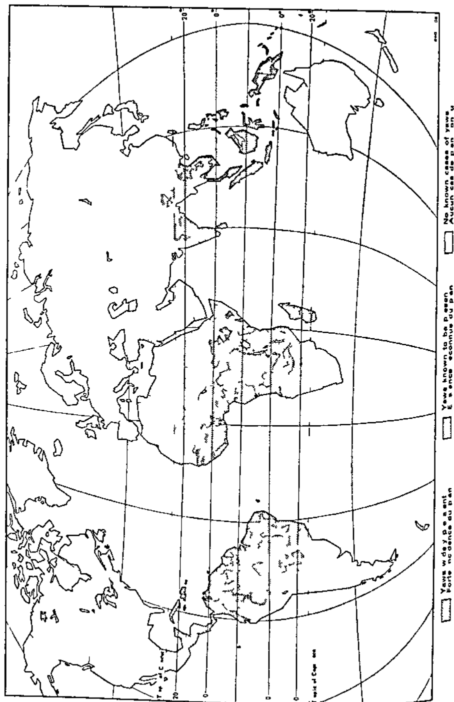


FIG 2 GEOGRAPHICAL DISTRIBUTION OF YAWS — RÉPARTITION GÉOGRAPHIQUE DU PIAN

malades du dispensaire souffraient de cette affection La necessite de donnees plus précises fut soulignee par tous ceux qui participèrent à la discussion

Dans le continent americain le pian a ete decele dans les pays les plus septentrionaux de l Amerique du Sud il n est que peu repandu en Amerique centrale mais par contre est tres frequent dans certaines iles des Antilles La maladie existe dans presque chaque Etat du Brésil bien qu elle ne constitue pas un problème grave dans le sud du pays En 1948 on donnait pour la frequence du pian en Guinée Britannique les chiffres de 26 4 par 100 000 habitants et de 413 par 100 000 en Guinee Française A Surinam la maladie a diminue durant le dernier quart de siècle mais elle persiste encore dans les parties centrales fortement boisees de l interieur Le pian *se rencontre dans les régions rurales du Venezuela et dans une mesure* moindre en Colombie Quelques cas sont encore connus dans l Equateur surtout le long des rivieres et dans les zones rurales de la côte du Pacifique La maladie est rare en Amerique centrale si ce n est à Panama ou l incidence etait de 35 8 par 100 000 en 1948 Dans le Mexique meridional la treponematose principale n est pas le pian mais la pinta bien que l on puisse rencontrer occasionnellement des cas de pian importes d Amerique centrale

Le pays le plus fortement atteint par le pian dans cette partie du monde est sans conteste Haiti la maladie y represente un probleme de sante majeur La Republique Dominicaine la Jamaique et Tobago sont d importants reservoirs de l infection Il y a quelques années encore le pian n etait pas rare à Cuba a la Martinique et a la Trinite mais il a maintenant presque disparu de ces iles et d autres Antilles

Le probleme du pian en Afrique a ete traite dans les articles de Hackett et de Vaucel En combinant les donnees de ces auteurs avec d autres il a ete possible de dresser une carte de l incidence de la maladie dans ce continent (fig 1)

Dans l Asie du Sud Est le pian est particulierement fréquent dans tout l archipel indonesien et dans la peninsule comprenant la Malaisie la Thailande et les Etats de l Indochine En Thailande la maladie est tres frequente dans la partie nord et nord-est du pays et en Indochine elle se rencontre surtout le long de la côte et dans le Laos

Dans l Inde le pian est limite a une ceinture de territoires dans les Etats du sud et du centre s etendant de l Etat de Madras à travers Madhya Pradesh Hyderabad et Orissa autrefois la maladie etait connue aussi à Malabar et Travancore Le pian se rencontre aussi dans les forets de l Assam En Birmanie il est rare mais quelques poches existent dans l interieur du pays Il a eté elimine presque complètement de Ceylan bien que quelques cas aient éte signales dans la jungle des regions reculees *à l intérieur* de l'île

Le pian existe aussi dans la région de l ouest et du sud-ouest du Pacifique Les iles du sud de l archipel des Philippines (Samar Leyte Min

danao) presentent l incidence la plus elevee. Parmi les aborigenes dans la partie orientale septentrionales de l'Australie. Dans les iles le pian est surtout frequent dans l'ouest, il co publique en particulier en Nouvelle Guinee et et Salomon Il decroit à mesure que l'on avan dans les archipels des Marquises et des Touamo

Geographiquement, le pian est une maladie rencontre presque exclusivement entre le Tropiq Capricorne (fig 2)

Il est evident que le pian n'existe que dans evoluees Plusieurs participants firent remarquer niveaux de vie plus éleves, l instruction avaient fai le Dr Huggins exprima par une formule succincte la où s arrete la route », la route representant le social

Plusieurs autres orateurs mirent en relief l'aspe lutte antipianique, soulignant l importance consider surtout dans les zones agricoles et les plantations, ou le développement economique

Part IV

DEVELOPMENT OF PLANS OF OPERATION

Partie IV

DÉVELOPPEMENT DES PLANS D'OPÉRATION

PLANNING FOR YAWS CONTROL IN SOUTH-EAST ASIA

N JUNGALWALLA, M D M P H

Adviser on Venereal Diseases and Treponematoses
World Health Organi ation Regional Office
for South East Asia

The countries of South East Asia constitute one of the largest and most important reservoirs of treponemal diseases in the world When the regional offices of the World Health Organization (WHO) and the United Nations International Children's Emergency Fund (UNICEF) were stablished in the region, it soon became clear that the control of yaws was ne of the outstanding problems for several of those countries The Govern nts of Indonesia and Thailand were the first to request technical advice n WHO and supplies and equipment from UNICEF for the purpose ringing the yaws problem in their countries under control

1949, a WHO consultant visited Indonesia and Thailand and was o obtain data on the extent and nature of the problem there he also ussed with senior health officials the most appropriate method of approach to the problem and the potential value of mass treatment with penicillin The health officials of the two countries expressed great interest in receiving international assistance and offered their full co operation in the proposed yaws-control projects

Public-Health Services in Indonesia and Thailand

The plans for these projects had to be fitted into the framework of the existing health services However these countries were just recovering rom the ravages of the second World War and many fresh problems d arisen In the case of Indonesia the whole administrative structure the country was still in the process of development this obviously uired immediate priority The resolving of internal strife also took edence over other problems The fact that plans for treponematoses control could be developed and executed is a tribute to the Governments and an indication of the importance they attributed to this problem

The lack of trained personnel, which had already been felt before the war, was made more acute by the disruption of education during the war and by the departure of foreign personnel The ratio of medical personnel to the general population cannot be taken as a proper indication of the

ment, and resurveys—and a research area for investigation of special problems

Planning and Programme: Some Aspects and Problems

Rate of work

One of the main problems is to estimate the speed at which the work can proceed in order to permit the setting of reasonable targets A great deal depends on the co operation of the officials of the administrative services of the Government To ensure that a village population will assemble at examination points, it is necessary to depend on the goodwill and aid of civil officials, particularly the village elder or headman His personal relationship with the village population is as important as health education and the persuasive power of the field teams The effectiveness of the campaign depends largely on the level of attendance, and for adequate coverage of the population the co operation of local leaders is essential

Experience with the present mode of approach has permitted sufficient data to be collected to gauge the performance of a team under optimal conditions It is considered that an average of 1,000 people can be examined per month by each member of the team, when no house visiting is done and where the population is not unduly scattered and the terrain is relatively easy to cover When house to house work is undertaken, as is necessary in research areas, and where the aim is to subject every person to a blood test and a clinical examination, the rate is necessarily slower In one such area in Thailand with a population of 2,891 people a 100% survey revealed 673 patients The total time to survey, treat, and make a control check of the patients at intervals of 3, 6, and 12 months for a team of three persons was 12 months, with 54 patients still unaccounted for at the third examination

Necessity for adequate coverage

In an area with limited health facilities, one may well ask what is likely to be the effect of a comparatively transitory attack on a specific disease

The necessity for adequate coverage has been shown by the work of a WHO team in India In the Ghund valley where the survey and treatment covered nearly 100% of the population, the number of new infections was reduced in one year from an average of 20 per month to 1 in 6 months. In another area with a survey and treatment of an undetermined percentage of the population, a resurvey 18 months after treatment resulted in the discovery of 68 new cases compared with 23 in the first survey Of these cases, 46 were examined and 34 diagnosed as syphilis 10 being in an infectious form

Decentralization

The objectives of the campaign have always been to set up a system capable of being continued, one that is an integral part of the country s health structure The work of Harding has given a sharp reminder of the necessity for continued effort if a permanent result is to be achieved Kodijat has long advocated the use of the policlinic in a campaign, regarding this institution as a useful gauge, to indicate what is going on in the villages in the vicinity and to give other valuable information The value of the health centres, where the control work is still being done in many parts of these countries, was recognized before the campaign started Programmes in both countries have reached the stage where their integration into the existing health structure, in order to make expansion possible, is the most important factor The local health authorities, under whose jurisdiction the expanding programmes are falling, will play an increasing role in the supervision and the day-to-day work, but central co ordination will remain a permanent feature of the programme The uniformity of the work carried out by the teams will be ensured by their being trained in one or more main centres The process of decentralization, however, has in fact already started

Use of paramedical personnel

In view of the conditions prevailing in the South East Asia region here mass campaigns are intended to cover large areas with populations ounting to several millions, and where funds and personnel are limited is imperative that the programmes should be simple and economical they are to cover those areas where the need is greatest Demands for paramedical personnel for health programmes will continue to increase and the supply already falls short of the needs The desirability of technical supervision is recognized; however, there is a limit beyond which such supervision cannot adequately be exercised The fact must be faced that these programmes, if they are to assume a nationwide character must continue to depend on paramedical staff of various degrees of training who work under limited medical supervision

The question arises whether paramedical personnel can undertake such an extensive programme While paramedical personnel has proved that it can often render very valuable services, I should like to sound a note of caution by saying that, in my opinion, although such workers can be rained to work well, no pains should be spared to ensure complete super ision of their early work Therefore, when fresh plans are developed for ork in a new area, it is necessary that there should be one medical officer for each team With the demand for further expansion of the programme further means will have to be found In Indonesia a simplified

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not permit sufficient attention to be paid to this aspect of the work Where a nurse is available in addition to the normal team personnel, a great improvement in this connexion is already apparent Unfortunately, the shortage of personnel prevents the inclusion of a nurse in each team, and, until this is possible, this part of the work will continue to be one of the weaker elements of the programmes

Future Pattern of Work

The future pattern of yaws control work in the South East Asia region would appear to be as follows

(1) continuation of the mass campaigns by trained paramedical personnel under limited medical supervision,

(2) greater use of existing health centres in the rural areas as bases from which the work can be extended,

(3) check examinations, through resurveys, at intervals still undetermined,

(4) the minimum use of laboratory facilities in mass campaigns and dependence on clinical diagnosis,

(5) the establishment of special research areas where teams, working under medical supervision and supported by laboratory and hospital facilities and by arrangements for clerical assistance and the analysis of data, will work on special problems apart from the mass-treatment work,

(6) the extension of competent leadership in the mass campaign to provide adequate services to the whole nation,

(7) the greater use of provincial personnel from decentralized health services, in contrast to the present use of a full-time staff under central control,

(8) the transformation of the present laboratories into public-health laboratory units and of the training bases into fuller training centres and bases for work on other communicable diseases,

(9) the final integration of treponematoses control work into the general pattern of the national health services, with a full time administrative officer in charge of the work, which will be carried out by the local health services

This will inevitably require some time to bring to fruition, probably as much as a decade Until that time, international assistance at all stages of development will be required and will be of the greatest value It is to be hoped that such help will continue to be given and that it will be fully and properly utilized

SUMMARY

Plans for treponematoses control in South East Asia after the second World War had to be fitted into the framework of the existing public health services, for which both trained personnel and funds ere lacking they consequently had to be mple and economical Certain data on e prevalence of yaws in both Indonesia d Thailand, with which this paper is concned, could, however, be obtained In case of Indonesia, information was lable on an area where yaws-control had been carried out between 1935 and 1940, and a general impression of the post war incidence of yaws could be gathered from figures from policlinics, where the commonest reason for attendance was skin infection of all types It was estimated that 15% of the Indonesian population suffered from yaws In Thailand, figures collected by village headmen provided a useful general indication of the prevalence of the disease—an estimated 4-8% of the population

In planning the control programmes it was felt that the areas selected as bases from which the work would be carried out had not only to provide facilities for administrative and supply services but also to serve as training and demonstration centres The work was planned as a mass campaign—including surveys diagnosis, treatment and resurveys—with the use of field teams who at the start of the programme would be trained by work in pilot projects to be undertaken in areas which would later serve as control areas

It is estimated that an average of 1,000 rsons can be examined per month by h member of the team when no houseing is done and where the population is not too scattered When house to-house work is undertaken and where every per-

RÉSUMÉ

L'organisation de la lutte contre les tréponématoses dans l Asie du Sud Est a dû être confiée, après la Deuxième Guerre mondiale, aux services de santé publique existants qui manquaient à la fois de fonds et de personnel qualifié dans ces conditions, seuls des programmes simples et peu couteux ont pu être envisagés On est parvenu toutefois en Indonésie et en Thaïlande, à réunir certains renseignements sur la fréquence du pian maladie qui fait l'objet du présent article Dans le cas de l'Indonésie on disposait déjà de quelques données sur une région dans laquelle une campagne antipianique avait été entreprise de 1935 à 1940 On a pu avoir un aperçu général de la situation en complétant ces données par celles de dispensaires qui reçoivent surtout la visite de malades atteints de dermatoses de tout genre Les estimations auxquelles on est ainsi arrivé indiquent que 15% de la population indonésienne souffre du pian En ce qui concerne la Thaïlande les chiffres rassemblés par les chefs de village permettent de penser que la proportion des pianiques représente environ 4 à 8% des habitants

Lorsqu on a dressé les plans d opération on a considéré que les régions choisies comme bases devaient non seulement offrir les locaux nécessaires aux services administratifs et au dépôt de fournitures mais également se prêter à la formation technique de personnel et à l exécution de démonstrations On a envisagé des campagnes de masse (enquêtes diagnostics traitements et nouvelles enquêtes à titre de contrôle) avec constitution d équipes mobiles qui au début devaient se mettre au courant en participant à l exécution de projets pilotes dans des régions destinées à servir plus tard de zones types

On estime que chaque membre d une équipe peut examiner en moyenne 1 000 personnes par mois lorsqu on ne procède pas à des visites à domicile et que la population n est pas trop clairsemée Ce chiffre est naturellement moins élevé s il faut se

son has to be examined clinically and serologically as is necessary in research areas the rate is of course, slower The necessity for adequate coverage of the population has been made obvious in treponematoses-control programmes in other countries

It is the aim of the campaign in South East Asia to set up a system capable of being continued as part of the normal health structure of the countries concerned Thus the work although subject to central co-ordination, is to be largely decentralized and carried out by the local health authorities To this end and in view of the shortage of trained medical staff, considerable dependence is placed on paramedical personnel of various degrees of training who work under limited medical supervision It has been shown that when such persons have had some experience their ability is considerable Trained, non medical persons may also be included in the teams to give injections or to perform clerical work, but it is felt that their number should not exceed two per team

It is stressed that information is required on the use of treatment schedules involving a single injection of penicillin and on the dosages required to treat contacts of infectious cases

The cost of the campaigns has been about $2 35 per person treated, a little less than half of this amount representing the cost of penicillin and a great proportion of the remainder being for non recurring expenses It is expected that as the programmes are expanded they should be cheaper to carry out A *simplified system* likely to be adopted in Indonesia promises to be very economical

When serodiagnosis is carried out in addition to clinical examinations, a varying number of cases with no history or clinical signs of yaws is found to be sero-positive It is, however, debatable whether the number by serodiagnosis

rendre dans chaque foyer et pratiquer un examen clinique et sérologique de tous les habitants Les campagnes menées contre les tréponématoses dans d'autres pays ont montré qu'il était indispensable d etendre les operations à une proportion suffisamment elevée de la population

La campagne entreprise dans l Asie du Sud Est a pour objet de mettre au point une organisation dont les services ordinaires de santé publique des pays interesses *puissent, par la suite, assurer* le fonctionnement C'est pourquoi les travaux bien que coordonnes par un organisme central, seront largement decentralisés et exécutes par les autorités sanitaires locales A cette fin et étant donne la pénurie de personnel medical qualifié, on aura largement recours à du personnel paramédical possédant une formation plus ou moins approfondie et place sous la surveillance générale de medecins Il a eté demontre que le personnel de ce genre, dès qu'il a acquis une certaine expérience, est capable de rendre des services très appreciables On pourra également faire appel, après formation préalable, à du personnel non medical pour pratiquer les injections ou pour effectuer les travaux de bureau mais le nombre de ces agents ne devrait pas etre supérieur a deux par équipe

L'article souligne qu il importe de reunir des renseignements sur la valeur de la pénicillino-therapie par injection unique et sur la posologie à appliquer dans le cas de sujets-contacts

Le coût de la campagne s est élevé jusqu ici à environ $ 2,35 par personne traitee près de la moitie de cette somme etant consacree à l'achat de penicilline et une grande partie du solde à des depenses non renouvelables On prévoit que les operations deviendront moins onéreuses à mesure qu'elles s etendront Au reste un système simplifié qui sera probablement adopté en Indonésie promet d être extrêmement economique

Lorsque les examens cliniques sont complétes par des examens sérologiques, on s aperçoit qu'un nombre plus ou moins grand de sujets, qui ne présentent pas de symptômes cliniques du pian ou ne sont pas d anciens pianiques ont une sero-

justifies the extra time and expense demanded.

Serious consideration should also be given to the question of health education and of the inclusion in the programmes of health activities other than those immediately concerning treponematoses control

In time, the treponematoses-control work in South-East Asia will be carried out within the general structure of the national health services with an administrative officer responsible for co-ordinating the work performed by the local health services That, however may take as long as ten years to bring about, and until then international assistance will be required

réaction positive On peut toutefois se demander si ces cas sont suffisamment nombreux pour justifier les dépenses supplémentaires *de temps et d argent qu entraînerait* l exécution d examens sérologiques

Il y a deux autres questions importantes à considérer l éducation sanitaire et l inclusion dans les programmes de lutte contre les treponématoses d activités sanitaires autres que celles qui concernent directement ces maladies

Ultérieurement, la lutte contre les tréponématoses dans l Asie du Sud Est sera organisée par les services generaux de santé publique des pays intéressés et un administrateur sera charge de coordonner le travail des services sanitaires locaux Mais il faudra peut-être attendre quelque dix ans avant que ce système puisse fonctionner et, entre temps l aide internationale demeurera indispensable

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YAWS IN BRAZIL

F NERY GUIMARÃES

Inst tuto Oswaldo Cruz Rio de Janeiro Bra il

General Aspects of the Problem

Historical background

The first Indians (Tupiniquins) seen by the discoverers of Brazil did not suffer, apparently, from any disease similar to what was then called in Iberia " boubas " or " bubas " Pero Vaz de Caminha, scribe of Pedro Alvares Cabral s Portuguese Armada, thus described them The skins are somewhat brown tending to red Their bodies are so clean limbed and sturdy, and they are as handsome as could be They look better and healthier than we do "[9] [a]

Nevertheless from the year 1558 onwards, travellers and writers in different periods have referred to the disease (yaws) as spreading among the Indians of Rio de Janeiro, Bahia and Maranhão The author of *Tratado descritivo do Brasil em 1587* (a manuscript of approximately the end of the 16th century) described the occurrence of yaws among the Tupinambas, near relations and neighbours of the Tupiniquins Yaws is very frequent among the Tupinambas who give it to one another, parti cularly when they are children "[22] [b]

Those Indians who still live in the hinterland of the country under primitive conditions are, however, free from the disease

The first African slaves were brought to Brazil by adventurers and colonists from Portugal After 1538, however, they were sent to Brazil direct from Africa Yaws was possibly brought to the New World by these slaves for it is believed that yaws has existed in Africa since the begin ning of time and in the 17th , 18th , and 19th-century slave ships epidemics spread easily during the long journey The sugar cane zones of Brazil to which the imported negroes were sent are still today foci of yaws the slaves descendants being the disease's most frequent victims [2] [3]

Geographical distribution

Although yaws is found in almost every State of Brazil in the southern region it does not constitute a major health problem Complete data

[a] " A feição dê es é serem pa dos mane ra de avermelhados Seus corpos são tão l mpos tao go dos e tão formosos que não podiam mais ser Andam tais e tao ri os e tão néd os que o não somos nós tanto

[b] " São os Tup nambas mu to su e tos à doença das boubas que se pégam uns aos out os mormente enquan o são men nos

on the incidence of the disease in the country are still not available but on the basis of information from the municipal "hygiene posts", the reports of doctors working in the hinterland, the reports of the specialized services, and the conclusions of the Annual Meeting of Brazilian Dermatologists and Syphilologists, held in Recife, Pernambuco, in September 1949, it is estimated that there are about 350,000 cases in the whole of Brazil—a country with a population of 52,000,000 (1950) The regions with the highest incidence are north, north east, and east Brazil (see fig 1)

FIG 1 DISTRIBUTION OF YAWS



Approximate distribution pattern of yaws

The dotted lines on this map and on the rainfall map (fig 3) represent the boundaries of the geographical regions north north east east south and west central (reading from the left, clockwise)

Environmental factors related to incidence

On account of its vast geographical expanse—8,516,000 km² (approximately *3 300 000 square miles)—which corresponds to almost* half of South America, Brazil presents great variations of climate, having hot, temperate and cold regions, however, for the most part, it lies within equatorial *and tropical zones* [8] *(See fig 2 and 3 for the zones of vegetation* and rainfall in Brazil)

Yaws generally exists in zones of a medium monthly temperature

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(2½ 8

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epidemiology In certain areas of the north east,[19] notwithstanding the lower temperature (less than 20°C (68°F)), the disease is more prevalent

FIG 2 ZONES OF VEGETATION



FIG 3 RAINFALL ZONES



Equatorial forest	above 2 000 mm
Tropical forest	1,800 2 000 mm
Savanna	1 500 1 800 mm
Araucaria forest and fields	1 000 1 500 mm
Prairie	below 1 000 mm
Campinas	

n the mountains where the rainfall and the humidity are higher Not only in the country as a whole but particularly in the local foci yaws is most prevalent in the equatorial and tropical forest and the savanna zones In all foci the agricultural labourers are in general the most prone

s

twelve years ago [20]

It is important to note that within the large endemic areas there exist zones free from the disease and zones with a high medium or low degree of morbidity

In Amazonas on account of its very sparse and scattered rural populations the natural spread of the disease is retarded On the other hand climatic conditions favourable to the development of yaws are found in the whole northern area As a result except in small towns large numbers of cases are seldom found grouped together although morbidity figures are high in this vast region of 3 500 000 km^2 (approximately 1 350 000 square miles) with a population of less than 2 000 000 Along the rivers and their tributaries and as far as civilization has extended yaws occurs In 1929 in the hospitals of Manaós on the Amazon river 600 persons suffering from yaws came from nearby neighbourhoods for treatment [10]

In 1940 in the course of a malaria survey, cases of the disease were found in Amazonas along the Madeira, Purus, and Juruá rivers

During May to October 1946, a census taken in the municipality of Breves (State of Pará) revealed 1,643 cases of yaws [7]

In the north east and east, where the population is more concentrated numerous nuclei exist where 5%, 10%, or 15% of the population suffer from yaws There are, nevertheless, large areas which, although densely populated, are free from the disease, because they do not present conditions favourable for its dissemination Of the 235,770 persons in the north east examined by the Sanitary Organization Division from 1945 to 1950, 19,062 (8 1%) had yaws lesions [4] A number of examples may be cited In the State of Pernambuco, yaws exists in at least 46 municipalities [17] In 1929 30, 4 690 cases of yaws were treated in a single "health centre" of the State of Ceará [1] In the State of Paraíba, perhaps the most infected in Brazil out of 9,146 persons seen in only two localities in the municipality of Serraria, 12 7% had yaws [5] On the other hand, in the east, in the municipality of Teófilo Otôni in the State of Minas Gerais, 25 186 cases were treated from 1934 to 1941 [18]

Generally speaking, in the zones where yaws exists in Brazil the small fly, *Hippelates*, of the order Diptera and of the family Chloropidae, is abundant The yaws patients believe that these flies transmit the disease and the observations of several authors support this view [11 15 16 21]

Whereas yaws may be contracted at any age, its greatest incidence occurs in the 9 20 years' age group Negroes and mulattoes always represent about 70% of the total number of cases The disease generally occurs among the poorer populations, where the standard of living is low, and conditions of hygiene are poor

Clinical and Epidemiological Studies of a Focus of Yaws in the Eastern Region of Brazil

The various foci of yaws in Brazil show very little clinical or epidemiological variation The following data on a focus of yaws studied in Baixada Fluminense (State of Rio de Janeiro) are, therefore of general interest

This focus comprises an area of approximately 1,800 km² (700 square miles) with a population of about 100,000 The region is situated on the Atlantic coast at a little above sea-level, and consists of lowlands, hills and mountains (100-800 metres (350 2,650 feet) high) and lagoons which are peculiar to the region The climate is changeable and there are only two distinct seasons The rains fall from October to April, with a monthly average of from 80 to 120 mm (3 5 inches) This is also the hot season, with a monthly average temperature of from 22°C to 25°C

(71°-77°F) During the rest of the year the rainfall varies from 44 to 66 mm (1¾-2½ inches), and the medium monthly temperature from 20°C to 22°C (68°-71°F) The relative humidity is always high during the whole year, varying from 80%-83% in the dry season to 83%-85% in the rainy season (data from the Meteorological Service, Ministry of Agriculture, Brazil) Forest and savanna predominate The mountains are always covered with rank vegetation, and present lower temperatures and higher rainfall and humidity This region is now beginning to be industrialized, but in the rural zones where yaws occurs primitive agriculture and cattle-raising predominate As a rule, the field labourers serve the owners of the lands or of the farms. Practically the only organized work is in the cultivation of sugar-cane and, on a small scale, of bananas As a result of erosion the lands are no longer suitable for coffee plantations The population is composed of "whites", negroes, and mulattoes Their capacity for work is lessened by poor nourishment and by endemic diseases, such as ankylostomiasis, tropical ulcer, and yaws Until very recently malaria was the most serious sanitary problem, but now, thanks to prophylaxis and mosquito control, it has been practically eradicated

Yaws occurs sporadically throughout this focus, as in all other foci in the national territory Small free areas alternate with others of high, medium, or low endemicity The disease occurs not only in the lowlands but also on the mountain slopes where it is frequently very prevalent In the towns yaws exists only in the suburbs

The records of the Yaws Study Centre, established in 1945, are kept in such a way that each individual's card can be readily found by any helper who has received previous training This card index makes possible the quick and easy computation of data on hundreds or even thousands of patients Data from 1,086 cases of yaws treated at the Centre are given in table I A description of the general clinical evolution of the disease in this focus has been published previously [14]

Table I shows that until the age of 8 years the incidence of yaws is practically the same in both sexes, but that between the ages of 8 and 20 it occurs more frequently in males than in females After the age of 20, again little difference in incidence is noted between the sexes The explanation is that the boys play in the open air and soon go to work in the fields, where they are subject to frequent trauma As to racial differences, the "whites" represent only about 30% of the cases, the other 70% occurring among the negroes or mulattoes, who represent the lowest economic class of the population

Table I also shows that of the 239 initial lesions (66% were on the legs and feet),[14] 143 (60%) were found in persons under 15 years of age, and 195 (82%) in persons under 21 More than 70% of the patients are suffering from the infectious stages of the disease (primary and secondary phases, isolated or associated) The incidence of each type of yaws lesion

TABLE I. CLINICAL AND EPIDEMIOLOGICAL DATA, ARRANGED BY AGE-GROUPS, FROM 1,086 YAWS PATIENTS TREATED AT THE YAWS STUDIES CENTRE (STATE OF RIO DE JANEIRO)

Data	Age groups (years)							Total	%
	under 1	1-3	4-8	9-14	15-20	21-30	31 and over		
Sex									
males	3	23	95	208	158	62	122	671	61.8
females	3	27	74	88	90	58	75	415	38.2
Race									
negroes	4	21	92	139	124	70	85	534	49.2
mulattoes	1	11	26	70	52	19	46	225	20.7
whites	1	18	51	88	72	31	66	327	30.1
Phase									
primary	1	2	11	11	10	2	3	40	3.7
primo secondary	4	23	38	53	42	16	23	199	18.3
secondary	1	25	115	208	109	38	37	533	49.0
tertiary	0	0	5	24	87	64	134	314	28.9
Yaws lesions									
initial lesion	5	25	49	64	52	18	26	239	22.0
framboesioma	4	45	123	198	111	48	54	583	53.7
framboesides	3	26	71	126	91	47	68	432	39.8
hyperkeratosis plantar	0	16	83	190	167	88	146	690	63.5
bone lesions	0	2	12	18	24	17	23	96	8.8
gummas and ulcers	0	0	5	10	21	22	37	95	8.7
gangosa	0	0	0	2	3	3	2	10	0.9
juxta-articular nodules	0	0	0	0	2	4	15	21	1.9
General symptoms									
adenitis	4	40	122	193	131	59	96	644	59.3
rheumatoid pains	0	10	78	146	143	89	141	607	55.9
headache	0	5	47	93	94	54	110	403	37.1
without the above symptoms	2	8	24	17	33	17	25	126	11.6

recorded on the card and the presence or absence of general symptoms (adenitis rheumatoid pains and headache) are also evaluated separately in table I

As to the palmo plantar hyperkeratosis the lesions of the hands are certainly less numerous than those of the feet which showed lesions in 63 5% of the cases When the frequent occurrence of the initial lesions and of the framboesioma, on the feet is taken into consideration together with the small number of tertiary lesions in the same place it is found that more than 70% of the patients have difficulty in walking and in working in the fields Walking and principally working barefoot in bad soil contributes to the common localization of yaws lesions to the feet The predominance of the initial lesions on the inferior extremities results from the frequent skin abrasions (' portal of entry) caused by accidents when playing and/or working in the fields

Yaws Prevention Services in Brazil

Brazil still does not possess a special service with a national programme for combating yaws Responsibility for its control belongs to the Sanitary Organization Division of the National Department of Health Ministry of Education and Health This Division maintains services in the north east (States of Ceará Pernambuco, Paraiba and Alagoas) and in the east (States of Minas Gerais and Espirito Santo) In 1952 work will be started in the north (municipality of Breves State of Pará) The work of the Sanitary Organization Division consists chiefly in creating rapid treatment centres (providing hospitalization) or posts " in the affected rural zones according to their economic and social influence There is no standardized treatment although penicillin is now the drug usually employed Generally, the chief doctor of the centre or post stipulates the method of treatment About 20 000 persons were treated in 1950 at the north eastern posts alone [4]

The State governments, too through their hygiene posts in the hinter land help the diseased although their aim is not the prophylaxis of illness but the cure of the patient himself

Consideration of Anti Yaws Campaigns Penicillin Therapy and Organization of Treatment

The treatment scheme which gave satisfactory results and which was adopted by us at the Yaws Study Centre was that of placing the new patient in a treatment colony associated with the Centre and keeping him there in order to ensure that he obtained adequate therapy At the same time areas from which the cases came were kept under constant

surveillance until no new cases or relapses occurred and the area could be declared clean'

In five years, 1,086 patients were treated, we obtained 93% clinical cures, and 70% serological reversions in primary and secondary yaws The serological reactions are shown in table II The treatment lasted 10 days, two injections of 10,000 15,000 units of penicillin being given daily The total dosage for the treatment of early yaws varied from 100,000 to 300,000 units according to the age group

TABLE II REACTIONS TO WASSERMANN TEST AFTER TREATMENT IN 772 CASES OF PRIMARY AND SECONDARY YAWS

React ons	Number	%
Total	568	73 6
Pos t ve *	169	29 8
Negat ve	399	70 2

* 55 (or 32 5% of the pos t ve reactions) were only weakly pos tive (++)

The patients with infectious lesions (primary and secondary lesions) were given preference in placing in the treatment colony because of the high contagiousness of their lesions

At present the infection is in a residual state in this focus

The misconception that yaws is a disease of benign nature has contributed to the delay in the establishment of direct control measures against the disease It may be preferable not to treat cases of this disease at all rather than to treat them inadequately, as such inadequate treatment interferes with the establishment of immunity [12] The treatment of yaws deserves the same attention as that of syphilis A complete treatment can only be administered under hospital conditions since in the field in ambulatory treatment patients rarely attend for more than three injections There are two reasons for this falling off in attendance (1) the patients homes are usually rather far away from the hygiene posts, and this makes visits difficult, and (2) after the first injection their lesions disappear and they think they are cured

It is recognized that the provision of ambulatory treatment by the hygiene posts is a hard task The rural zones are inhospitable and difficult of access, and means of communication are scarce, these factors, combined with poor co operation from the inhabitants, who lack sanitary education make difficult a work which seems to be easy when planned For example when a treatment schedule of six injections with Mapharsen was instituted in 1946 in Amazonas by the Special Service of Public Health (Serviço

Especial de Saúde Publica (SESP)), the disappointing response shown in table III was obtained at a subpost in Breves (State of Pará)

TABLE III ATTENDANCE OF YAWS PATIENTS FOLLOWING A COURSE OF TREATMENT WITH MAPHARSEN AT A "SUBPOST" IN BREVES (STATE OF PARÁ)

Injections	Patients	
	Number	%
1st	157	100 0
2nd	98	62 4
3rd	67	42 7
4th	40	25 5
5th	30	19 1
6th	11	7 0

To overcome these obstacles the system of 'lodging' has been adopted At the same time, temporary improvement in the patient's nutrition and the building-up of the patient's haemoglobin are attempted Agents attached to the Centre, and chosen from local men trained in the diagnosis of yaws, make regular house to-house visits to discover new yaws cases, and then send them by truck to the Centre for treatment The patients are housed in large wooden barracks annexed to the Centre The rural teachers give voluntary and extremely valuable help during the campaign, and assist in discovering new cases through contacting the families of their pupils

There is one problem of a social nature that must be considered namely, the complete disorganization of the economy of families as a consequence of the interruption of work of their chiefs or of their subsidiary contributors (wives, and sons over 10 years of age) This is one of the principal causes of lack of co operation from the patients We have overcome the difficulty by the introduction near the Centre of small scale cultivation of the pulse, fruits, and cereal grasses used in the nourishment of the patients themselves On the third or fourth day after treatment the patients, in spite of having incompletely healed lesions on the soles of their feet, can take part in the work and receive remuneration that compensates for the loss of their salaries during the 'lodging' period

This method is undoubtedly expensive, since penicillin is not a cheap drug and the "lodging" is costly But in view of the fact that, at least in the last 20 years, hundreds of hygiene posts in Brazil have fought yaws with a minimum of practical results to the communities involved as is shown by the continuance of old foci and the appearance of new ones

centre between 1945 and 1950 are assessed in illustration of the epidemiology of yaws in all Brazilian foci

The provision of ambulatory treatment by the hygiene posts, etc, has never been very successful, partly because of difficulties of communication, but largely because of lack of co-operation from the patients, who are rarely prepared to make the number of visits necessary for a complete cure By providing accommodation during a ten day course of penicillin treatment, and remunerative work in the fields for the patients as soon as they were sufficiently well to undertake it, in five years the Yaws Study Centre obtained 93% clinical cures and reduced yaws infection in the area to a "residual" state

Although the development of such treatment colonies is expensive the author suggests that it is the only possible way of combating the problem of yaws in Brazil The main cause of failure in anti-yaws campaigns in the past has been relapses due to inadequate treatment By taking the Brazilian yaws foci sector by sector, and by maintaining the constant watch which is possible only when treatment colonies are established yaws infection could at least be reduced to a "residual" state The complete eradication of yaws will be achieved only when the poor conditions under which the afflicted populations live are raised to a "civilized" level

de 1945-50 sont resumés dans l'article et illustrent les caractères épidemiologiques du pian dans tous les foyers du Brésil

Le traitement ambulatoire dans les postes sanitaires et autres centres similaires n'a pas donné de résultats bien favorables en partie à cause des difficultés de communication, mais surtout en raison de l'inertie des malades, qui ne s'astreignent guère au nombre de visites necessaire à une cure complète En assurant aux malades une hospitalisation de dix jours, duree du traitement à la pénicilline, en leur assurant en outre un travail agricole bien rémunéré lorsqu'ils seront en assez bonne santé pour l'entreprendre, le Centre d'etude du pian a obtenu en 5 ans 93% de guérisons cliniques et réduit l'infection pianique à un stade «residuel»

Ces centres de traitement sont certes coûteux, mais de l'avis de l'auteur ils représentent le seul moyen pratique de combattre le pian au Bresil Les échecs des campagnes antipianiques anterieures ont ete dus aux rechutes, survenues à la suite de traitements insuffisants En traitant les foyers de pian, secteur par secteur et en maintenant une surveillance constante — ce qui n'est possible que si des «colonies de traitement» sont etablies — il serait possible de reduire l'infection à un stade residuel Le pian ne disparaîtra complètement qu'avec l'amelioration des conditions de vie des populations affectees par la maladie

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DISCUSSION : PART IV

Chairman Dr A M CRUZ
Rapporteur Dr S LAIRD

In yaws areas the infection is readily recognized by lay persons, including the patient himself It is not necessary to have a treponematologist to recognize each case of yaws, but an experienced treponematologist is required to advise governments on policy and planning, to teach non medical auxiliaries, and to direct the activities of the public health nurse It was felt that for these reasons a public-health officer would be less valuable than an experienced treponematologist, but it was agreed that the latter should have a keen public health approach Resourcefulness, appreciation of logistics, and ability to improvise and carry out running repairs were other qualities suggested

With sound teaching, simple methods of diagnosis and treatment and a demonstration centre, it was quite practicable to train as medical auxiliaries those who were interested and who possessed some basic education After gaining experience under good supervision, such persons had been shown to be as efficient in the diagnosis of typical yaws and the administration of drugs as most medical officers However they should not generally be expected to attempt differential diagnoses, and the need for close supervision until they had proved their ability was stressed By such staff dilution a yaws campaign could be expanded and accelerated with a saving in more highly trained personnel, who were always desperately scarce in countries where yaws was a public health problem In addition a saving in salaries resulted The dilution of staff must have a limit, and this should be defined for each project

Could yaws be controlled by treatment alone, or might it not first be necessary to discover in detail how the infection is spread from case to case ? The need for further research to explain still unknown epidemiological features was expressed, but there was general confidence that yaws could be controlled by the energetic use of penicillin If sufficient infectious cases in a rural community could be quickly rendered non infectious by penicillin the opportunities for infection of non immunes, and reinfection of treated cases, w
in the asymptoı
cases and a su
to treat asymptomatic household contacts and to establish some local

organization to detect and treat such infectious cases as might appear following the initial mass attack It was pointed out that the age group 0-20 years included most of the infectious cases, and that available control measures could advantageously be concentrated on this section of the community Yaws was largely a family disease, hence the need to treat *family and household contacts*

Yaws is confined to rural communities in the tropics with a low socio economic level, and, while it was agreed that all efforts to improve environmental and socio-economic conditions should be encouraged, progress in this connexion must of necessity be very slow and expensive It was felt that penicillin *might well reduce the incidence of infection to a low level* in such communities, although complete eradication might not be achieved until improvement in the environmental and socio economic conditions had been effected

While serological tests are necessary in a pilot study or control area it will often be impossible, and perhaps undesirable, to carry out serological testing in a mass campaign. Without serological tests, latent cases will be missed Do such untreated and undiscovered latent cases form an important reservoir of potential infectiousness ? The answer to this question must await pilot studies

Should the control project concentrate on yaws alone, or only form part of a more general public-health programme ? Whether the project is to be monovalent or polyvalent is a most important decision during the planning stage As resources and personnel, drugs and funds, are always *strictly limited it may well be best to concentrate them—at least initially—* on a monovalent yaws project The dramatic results of treatment in yaws will increase the receptiveness of the community to other elements of a polyvalent programme, and, with a decrease in the yaws problem, and the increasing availability of more trained workers it may later be desirable to shift the emphasis and resources to other projects included in a polyvalent programme

DISCUSSION PARTIE IV

Président Dr A M CRUZ
Rapporteur Dr S LAIRD

Dans les regions d endemie pianique la maladie est aisément reconnue même par des personnes non prevenues, y compris le malade lui meme Point n'est besoin d'un treponématologue pour poser le diagnostic dans chaque cas Mais ce specialiste est necessaire, par contre, pour donner des avis aux gouvernements sur l'organisation de la lutte, pour instruire

les auxiliaires qui n ont pas de formation medicale et diriger le travail *de l infirmiere de santé publique*. Il est *apparu que pour ces diverses* raisons un specialiste de la santé publique serait moins immediatement utile qu un tréponématologue qualifie mais il a ete convenu que ce dernier devait considérer sa tache sous l angle de la sante publique On demandera du titulaire qu il soit un homme de ressource sache faire face aux evenements et trouver des solutions d urgence et qu il s entende à organiser personnel et materiel

Grâce a un enseignement bien conçu à des methodes de diagnostic et de traitement simples à l existence d un centre de demonstrations des personnes possedant des notions elementaires et s intéressant à la question peuvent être instruites et devenir des auxiliaires medicaux Tels de ceux ci après avoir acquis de l expérience sous une surveillance competente se sont reveles aussi habiles que bien des medecins à diagnostiquer le pian classique et à administrer les medicaments On ne peut toutefois dans la plupart des cas leur laisser la responsabilite d un diagnostic differentiel et ainsi qu on le fit remarquer il importe de les surveiller avec attention jusqu à preuve de leur competence En elargissant de cette façon le recrutement du personnel on peut etendre et accelerer une campagne antipianique et assigner des taches plus specialisees au personnel de formation superieure dont la rarete se fait si cruellement sentir dans les pays ou le pian pose un probleme de sante publique Ces mesures permettent aussi une economie de salaires Cette expansion des attributions a du personnel auxiliaire ne depassera cependant pas certaines limites qui doivent être precisees pour chaque programme

Le pian peut il etre combattu par le seul traitement ou bien n est il pas necessaire d abord de se rendre compte de façon precise comment l infection passe d un sujet a l autre ? Les participants s accorderent a recommander des recherches sur les points encore obscurs de l épidemiologie tout en se declarant assures du succes de la lutte effectuee par le traitement intensif à la penicilline Si dans une collectivite rurale un nombre assez eleve de cas pouvaient être rendus non infectieux grace à la penicilline les risques d infection de sujets non immuns ou de reinfection des sujets traites seraient considerablement reduits La presence au debut du traitement des cas cliniques de personnes infectees mais encore au stade asymptomatique d incubation et les rechutes survenues plus tard ont montre la nécessite de traiter les contacts familiaux meme s ils ne presentent pas de symptomes et d etablir une organisation locale pour deceler et traiter les cas infectieux qui pourraient apparaitre ulterieurement On a souligne que la plupart des cas infectieux s observaient dans les groupes d âge de 0-20 ans et que la lutte pourrait etre concentree sur cette fraction de la collectivite avec de grandes chances de succes Le pian est essentiellement une maladie familiale aussi est il necessaire de traiter les contacts familiaux et domestiques

Le pian est limité aux districts ruraux des tropiques, ayant un niveau de vie très bas On s'accorde à reconnaître que les efforts destinés à améliorer les conditions économiques et sociales doivent être encouragés mais que les progrès dans ce domaine seront lents et coûteux De l'avis général, il serait possible, grâce à la pénicilline, d'abaisser considérablement le taux d'infection pianique dans ces collectivités, mais on ne peut espérer supprimer la maladie tant que les conditions de vie n'auront pas été améliorées

Les tests sérologiques sont certes nécessaires pour mener à bien une expérience modèle dans une région donnée, mais il ne sera souvent pas possible — *et même pas souhaitable — de procéder à des épreuves sérologiques* dans une campagne systématique Sans doute, faute de tests sérologiques, des cas latents échapperont au dépistage Ces cas, non décelés et non traités constituent ils des foyers importants d infection virtuelle ? Il faudra attendre des résultats d'études types pour répondre à cette question

Le programme doit il se borner à la lutte contre le pian ou doit il être intégré dans un ensemble plus vaste de mesures de santé publique, en d'autres mots doit il être « monovalent » ou « polyvalent » ? C est là une question très importante qui se posera dès le début, lorsqu'il s agira de tracer les grandes lignes du programme Il paraît plus rationnel, au commencement du moins, de concentrer les ressources disponibles (personnel, fonds, médicaments), puisqu elles sont très limitées, et d entreprendre un programme « monovalent » Les résultats obtenus dans le traitement du pian frappant l'imagination des habitants, leur feront accepter plus aisément d autres parties d'un programme « polyvalent » La régression du pian d'une part, le nombre croissant de collaborateurs expérimentés d autre part, permettront par la suite, de faire porter les efforts sur d autres aspects d un programme « polyvalent » d'amélioration de la santé publique

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Part V

DEMONSTRATION, SURVEY, AND TRAINING PHASE

Partie V

DÉMONSTRATIONS, ENQUÊTES ET FORMATION TECHNIQUE

DIAGNOSTIC AIDS IN MASS-TREATMENT CAMPAIGNS AGAINST YAWS

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It is generally agreed that the serological laboratory can, and should play an important role in mass-treatment campaigns against yaws The decisions as to when routine serological testing should be performed, which serological procedure should be employed, and the frequency and duration of post treatment serological examinations will depend on many factors which include adequacy of laboratory facilities, availability of trained personnel, climate, geography, customs, co-operation of local and international health authorities, and many other conditions which may vary in different areas of the world Unfortunately, the facilities for satisfactory serodiagnosis are least adequate in those areas where the prevalence of yaws is highest

The ideal in a mass-treatment campaign would be a house to house canvass in which all individuals in a given community were subjected to a careful examination for any clinical or anamnestic evidence of yaws as well as to a serological examination This type of survey is often difficult or even impossible It has been repeatedly demonstrated that, if the health authorities depend on voluntary attendance, only 25% to 50% of the individuals will present themselves for treatment, whereas from 80% to 90% of the individuals can be examined and treated by means of a house to house canvass

There are definite limitations to any treatment campaign based solely on clinical examinations With this method patients with no clinical manifestations or in the incubation stage are missed It is therefore not possible to detect the seropositive, asymptomatic, latent-yaws patients who may ultimately develop cutaneous relapses, thereby setting up new infectious reservoirs Furthermore, if one depends entirely on a clinical survey, some non treponemal diseases that will respond to penicillin therapy may be included causing a fallacious increase in cure-rates, while the possible inclusion of some non treponemal conditions which do not respond to penicillin would result in a fallacious decrease in cure rates The number of patients with non venereal conditions subjected to penicillin therapy would depend on the diagnostic acumen of the clinicians Dependence on anamnestic

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evidence is also fraught with difficulties The word soon gets around among the local population that they will receive some "magic medicine" if they will state that they have had yaws, and this they will gladly do in the hope that it will cure their many real or imaginary ills

There are also many limitations to a serological survey, since a house to house serological examination of all inhabitants would slow up the work considerably Furthermore, the interval between the serological survey and the institution of treatment would be of several days, and some of the individuals needing therapy would not be available when the treatment teams revisited the houses This type of survey would also require extensive laboratory facilities for the examination of the large number of blood specimens, and well trained serologists to evaluate the results

Mass treatment of yaws can be carried out effectively before establishing adequate serodiagnostic facilities It is sometimes quite impracticable to await the development of modern serodiagnostic laboratories before instituting mass therapy

In high-prevalence areas it may be feasible to treat entire populations without any regard to serological examinations In low prevalence areas however, there is a great need for careful serological examinations with tests known to have high levels of sensitivity and specificity In those areas where the incidence of biological false positive reactors remains constant, and the number of patients with yaws decreases, the relative proportion of biological false positive reactions will increase Clearly, there is great need for a simple, inexpensive, and yet consistently effective serodiagnostic procedure in low-prevalence and underdeveloped areas with inadequate laboratory facilities and an insufficient number of trained technicians To date, the filter paper method and the various modifications of the Chediak reaction have not been proved to be of sufficient sensitivity and specificity as compared to the standard tube- or slide tests performed on sera [4] In my experience,[7] the use of capillary tubes for collection of specimens has been found to be satisfactory in the USA, but this would not be a practical approach to the yaws problem because of the lack of laboratory facilities and trained personnel

The first phase of a mass treatment programme is the development of plans of operation The laboratory aspects must be considered from two points of view, that of the mass treatment and that of the pilot area If serodiagnostic procedures are to be employed in the mass treatment area the test must be carefully selected according to the following factors

(*a*) Method of obtaining blood specimens If it appears that the only feasible means of collecting blood is by finger puncture, it will be necessary to use a filter-paper method, a modification of the Chediak test, or the capillary-tube technique

(*b*) Sensitivity level As a screening procedure, use should be made of the test with the greatest sensitivity possible without decreasing its inherent

specificity The seropositive reactors can then be carefully examined and questioned for any clinical or anamnestic evidence of yaws

Limitations of Mass Serological Surveys

False negative reactions

Negative serological reactions are to be expected during the incubation period of the disease This seronegative phase may persist for six weeks or longer after exposure to infectious yaws The duration of this phase will depend on several factors, including the size of the infectious inoculum and the immunological response of the individual, as well as the sensitivity and the type of the test employed There is some evidence to indicate that in early yaws certain tests of the complement fixation type may become positive before some of the tube and slide-flocculation procedures Seronegative yaws may be due to a number of factors (*a*) a minimal amount of circulating antibody, which cannot be detected by tests with ordinary sensitivity, (*b*) the presence of too much antibody so that negative zone reactions occur, (*c*) the use of serological tests with low levels of sensitivity, (*d*) the use of fresh serum containing considerable amounts of thermolabile inhibiting substances, and (*e*) the presence of a thermostabile inhibiting substance in the albumin fraction of the serum

It should also be pointed out that true negative reactions may be obtained in non treponemal conditions which may simulate yaws such as impetigo, tropical ulcer, purulent skin infections and traumatic or occupational palmar and plantar hyperkeratosis

False positive reactions

While it is true that most positive serological reactions obtained with the current non specific lipoid antigens are due to treponemal diseases and perhaps represent some type of immunological response it is no less true that some positive results are unrelated to yaws Such false positive reactions may be caused by a variety of infectious diseases and metabolic disturbances and may be due to the presence of antibody-like substances similar to the antibodies produced in treponemal diseases to an alteration of the sero globulin fraction, or to an increase or alteration of some chemical substance or substances in the blood Furthermore, false positive reactions may occur in sera containing no antibodies and may be caused by (*a*) technical errors in the collection and labelling of specimens (*b*) the use of unsatisfactory blood specimens (contaminated or haemolysed), (*c*) errors in the performance of the serological tests, (*d*) the use of faulty materials and reagents in the test, or (*e*) errors in recording or reporting the final results With the improvement of serological techniques and the use of improved materials, especially purified antigens of the cardiolipin type, there has been a marked reduction in the incidence of false positive reactions

There is still another problem that may confront the serologist in evaluating the serological response of an adequately treated patient with yaws Several months or even years after completion of therapy, the patient may develop an intercurrent non treponemal infection which would produce false-positive reactions and a subsequent rise in serological titre Such an individual is often categorically and fallaciously classified as a sero-relapse or a treatment failure

Seroresistance

Positive serological reactions may persist in arrested and ' burned out" *cases for many years, and in such individuals treatment or re treatment* is not indicated In yaws, as in the other treponemal diseases persistent positive serological reactions do not indicate a persistent infection A diagnosis of latent yaws should not be made on a seropositive reactor without clinical or anamnestic evidence of the disease unless it is possible to demonstrate specific antibodies by means of the Nelson treponema immobilization or phagocytosis phenomenon This, of course, is not practicable in mass treatment campaigns but might be considered in the p lot area

In the consolidation phase of the mass treatment programme the question of the serological criteria for re treatment may arise Re treatment should be instituted if there has been a sustained rise in serological titre which may indicate either a relapse or an asymptomatic reinfection it should never be instituted solely because of persistence of positive serological reactions

There are, therefore, indications for, and limitations to the use of serodiagnostic procedures in treatment campaigns Unless one is aware of the many limitations inherent in serological investigations there may be many errors of omission and commission

Functions of the Laboratory in the Pilot Area

Whether or not serodiagnostic procedures are to be employed in the mass treatment area, it is of the utmost importance that a well controlled laboratory be set up in the pilot area as soon as possible, preferably before mass therapy is instituted It is during the demonstration, survey, and training phase of the programme in the pilot area that the laboratory can *supply much valuable information that will be used during the expansion* and consolidation phase This information will include the following

(1) The determination by darkfield microscopy of the disappearance-time of treponemes from lesions after treatment in order to ascertain the efficacy of the penicillin preparation to be employed It should also be the function of laboratory personnel to determine the disappearance time following the use of the other antibiotics It has been our experience that

[illegible] penicillin [illegible] d that the [illegible] han it is after treatment with aureomycin, chloramphenicol, terramycin, or dihydrostreptomycin Comparative studies of this type should be carried out in the pilot area Any new treponemicidal drug should also be tested for disappearance-time, as determined by the darkfield microscope, in the pilot area

(2) The serological trend following therapy as determined by quantitative serological tests Progress may be considered satisfactory so long as there is a progressive reduction in serological titre Short, intensive methods of therapy with penicillin are terminated while the patient is still seropositive If serological tests are to be of any value in determining the efficacy of the therapy, quantitative procedures must be employed before treatment and at three month intervals for one year following completion of therapy in the primary control-area As a minimum requirement, tests should be done at least at six and twelve months In a recent article on studies in penicillin treatment of syphilis by Arnold et al ,[1] it is stated

"In judging the success or failure of therapy, the ideal serologic follow up of patients consists of an examination every 2 weeks, or at least every month, for the first 6 to 12 post-treatment months In the evaluation of an experimental therapy, a battery of qualitative serologic tests and a quantitative test, performed regularly is advantageous for observation However, in a public health program or in routine therapy utilizing a schedule known to be effective essential information may be gained from the regular use of one qualitative and one quantitative test performed preferably with a cardiolipin lecithin antigen"

There are several factors which influence the length of time required to obtain a seronegative reading [5]

(a) Stage of disease The older the disease, the longer the treponemes are present and the longer it takes for the body cells to stop forming antibodies As a rule, patients with secondary yaws require more time to attain seronegativity than patients with seropositive primary lesions

(b) Immunological response of individual patients Some patients with yaws develop more antibodies than others, and they usually require more time to attain seronegativity

(c) Serological titre As a rule, patients with high serological titres at the onset of therapy require more time to attain seronegativity than those with relatively low titres

(d) Sensitivity of the serological procedure The more sensitive the serological test, the longer it will take to show seronegativity When a battery of serological tests of varying sensitivities is employed, negative reactions may be obtained with the less sensitive tests long before the more sensitive tests can show negative results

(*e*) Type of test Certain types of tests may remain positive long after others have become negative, even though they may be of the same relative range of sensitivity

It must be pointed out, however, that there are many variants of the above factors, and no set rules can be made to determine or anticipate the length of time required to attain seronegativity The serological response in early yaws is certainly much slower than that observed in early syphilis with similar schedules of therapy One of the reasons for this difference may be that, in syphilis, therapy is usually started within a few weeks after the development of cutaneous manifestations, whereas in yaws patients usually have their infection for many months or even years before receiving therapy Studies carried out in the pilot area might supply information regarding the slow serological response

(3) Differentiation between relapse and reinfection The criteria for indisputable yaws reinfections are quite rigid, and, unfortunately, the patients are not observed at sufficiently frequent intervals to satisfy all the requirements It is therefore often quite difficult to determine whether the patient has developed a new infection or if there has been a relapse of the old infection From our own observations in syphilis, we have felt it possible to differentiate between relapse and reinfection by carefully conducted quantitative serological studies made at frequent intervals

After successful penicillin therapy in patients with early syphilis there was usually a progressive reduction in seronegativity followed by the development of a darkfield positive but seronegative lesion at a new site Shortly afterwards, the patients developed seropositive reactions with rapidly increasing titres In treatment failures or relapses a sudden increase in serological titre was noted, followed in about one month by clinical evidence of a mucocutaneous relapse in the majority of instances If patients treated with penicillin were to be subjected to serological examinations at weekly or monthly intervals, it might be possible to predict a clinical relapse before there was any clinical evidence, by a progressive increase in serological titre on repeated examinations Such studies might be carried out in primary control areas in order to determine whether it is possible to differentiate between clinical relapse and clinical reinfection by means of serological examinations

Problems Requiring Further Investigation

There are various aspects of yaws that require laboratory investigations to fill in the gaps in the knowledge of this disease [2, 3] Some of the following problems might usefully be studied in the control area

Do the newborn infants of seropositive mothers with yaws have positive blood tests ? Are these positive reactions detected more readily with complement fixation tests than with flocculation tests, as has been observed

method and the modifications of the Chediak reaction have so far not proved of sufficient sensitivity or specificity when compared with the standard tube- or slide tests performed on sera However, if the only feasible method of collecting blood specimens in mass examinations is by finger puncture, then it would be necessary to use one of the former methods or the capillary-tube technique

There are certain limitations inherent in serological investigations of which the health worker must be aware if he is to avoid serious errors For instance, false-negative reactions may be expected during the incubation period of yaws or may result from such factors as thermolabile- or thermostabile inhibiting substances in the serum, the presence of such a small quantity of circulating antibody that it cannot be detected by tests of ordinary sensitivity, or the presence of too much antibody so that negative zone reactions occur True-negative reactions may also be obtained in non-treponemal conditions that simulate yaws Again, false positive reactions may occur, caused by a variety of infectious diseases or metabolic disturbances, however, with the improvement of serological techniques and materials, especially purified antigens of the cardio lipin type, there has been a marked reduction in the incidence of false positive reactions

Positive serological reactions may persist in arrested cases of yaws, but treatment or re-treatment is not indicated in such cases In the treponemal diseases, a persistent positive serological reaction alone does not necessarily indicate a persistent infection Re-treatment should however, be given if there is a sustained rise in titre, which may indicate either relapse or asymptomatic reinfection

Regardless of whether serodiagnosis is used in the mass treatment area, a well controlled laboratory should be set up in the pilot area, for it can supply much valuable information to be used during the expansion and consolidation phase of

La méthode sur papier filtre et les cations de la réaction de Chedia sont pas révélées suffisamment sen spécifiques, comparées aux épreu logiques standards en tube ou su c'est pourtant à l'une d'elles — technique des tubes capillaires - faut recourir dans les cas où les ments de sang ne peuvent se faire piqûre du doigt

Les examens sérologiques sont certaines limitations que le person taire doit connaître, afin d'évi erreurs graves C'est ainsi que l s'attendre à rencontrer de fausses r négatives pendant la période d inc du pian, causées par certains facte que la présence de substances inh thermolabiles ou thermostables sérum, l'existence d'une quantité corps si faible qu'elle ne peut être par les tests de sensibilité courant présence d'un excès d'anticorps c voque des réactions de zone négat revanche, de vraies réactions n peuvent s'observer dans le cas de n non tréponémiques qui simulent En outre, on peut constater de réactions positives, causées par c tiples maladies infectieuses ou des t du métabolisme Cependant, l'ai tion des techniques et des réactifs giques, notamment l'emploi d'a purifiés du type de la cardiolipi provoqué une réduction marqu fausses réactions positives

Des réactions sérologiques p peuvent persister dans certains ca pian a été stabilisé, sans qu'il y ait traiter le sujet ou de renouveler le ment Dans les tréponématoses, le n de la séropositivité ne suffit pas à à indiquer une infection persist convient cependant de traiter à n les malades lorsque l'on constate u vation soutenue du titre, car cette él peut être le signe soit d'une rechu d'une réinfection asymptomatique

Que le sérodiagnostic soit appli non dans la zone où l'on procède a tement systématique, il importe d un laboratoire bien organisé dans l expérimentale-type Ce laborato effet, peut fournir de nombreux ren

he control programme Thus, the labora ory should determine the disappearance me of treponemes from lesions by dark eld microscopy following treatment with enic llin and other antibiotics The sero- ogical trend following therapy should also e determined by quantitative serological ests carried out before treatment and at hree-monthly intervals for one year after reatment Several factors may influence he length of time required to obtain a ronegative reading the stage of the isease at the time of treatment the mmunological response of the patient the rological titre at treatment and the type nd sens tivity of the test used The aboratory in the pilot area should also onduct studies to ascertain whether it is ossible to d fferentiate between clinical lapse and clinical reinfection by sero- og cal examination

There are also a number of other aspects f yaws on which still too little is known nd which require laboratory investigation tudies should be carried out to determine he influence on the newborn infant of eropos tive yaws in the mother these hould include investigations into the most ppropriate type of test for serological xamination of the infant and into the ossibility that a passive transfer of anti odies from mother to foetus in utero or om mother to infant, will cause early eversal to seronegativity or protection aga nst yaws infection The value of the uetin reaction as a diagnostic procedure hould be investigated and further inquiry hould be made into the question of mmunity both natural and experimentally nduced

ments utiles dont on tirera parti au cours des phases de developpement et de conso lidation de la campagne antipianique Il devrait par exemple determiner par des examens sur fond noir le moment ou les treponèmes disparaissent des lésions à la suite du traitement par la penicilline ou d autres antibiotiques L evolution serolo gique consécutive au traitement devrait aussi être precisee par des tests serologiques quantitatifs executes d abord avant le trai tement puis à intervalles trimestriels pen dant une annee après le traitement Plu sieurs facteurs peuvent modifier le temps necessaire pour obtenir le virage a la seronégativité notamment le stade de la maladie au moment du traitement la reponse immunologique du malade le titre serologique lors du traitement la nature et la sensibilité du test utilise Le labora toire de la zone experimentale type devrait egalement examiner s il est possible de differencier par l examen serologique une rechute clinique d une réinfection clinique

Divers autres aspects du p an n ont pas ete suffisamment éclaircis et demandent à etre étudies au laboratoire Il conviendra t de déterminer l influence sur le nouveau né du pian donnant une séroreaction positive chez la mère L etude devrait porter sur le type d epreuve serologique le plus indique pour l examen de l enfant et sur la possi bilite d une transmiss on passive des anti corps de la mère au fœtus in utero ou de la mère au nouveau ne transmission qui pourrait provoquer un virage precoce a la séronegativite ou conferer une protection contre l infection La valeur de la réaction à la luetine comme moyen de d agnostic devrait être examinée et l faudrait appro- fondir la question de l immunite tant naturelle que provoquée

LA CAMPAGNE ANTIPIANIQUE EN HAÏTI *

Dr Edouard PETRUS,[a] Dr Sacha LEVITAN[b]
Dr Adhemar PAOLIELLO,[c] et Dr Rose NICOL[d]

Le pays

La Republique d'Haiti, d'une superficie de quelque 28 000 km² occupe la partie ouest de l île, connue sous le nom d Haiti, Hispaniola ou Saint Domingue Le reste de l'île est occupe par la Republique Dominicaine d une superficie d environ 50 000 km² La Republique d Haiti la plus peuplee, a un climat tropical modere La topographie du pays en majeure partie montagneux, determine une distribution de la pluie apparemment capricieuse, dont la vegetation se ressent L agriculture est la principale source de revenus Recemment encore, l'on n'avait aucune donnee sur la population le recensement de 1950 a permis de l evaluer a 3 000 000 d habitants environ Il n'existait jusqu ici aucune donnee sur la repartition et l incidence du pian

Dans ce pays accidente, les voies de communications ne sont que des sentiers cotoyant des precipices Le paysan vit dans des montagnes abruptes Il voyage à cheval, à dos d'âne ou de mulet, et le plus souvent à pied Pen[dant] la saison pluvieuse, le probleme des communications est angoissant [et] les alluvions constituent un obstacle parfois infranchissable

L île d Haiti est divisee en départements les departements en arron[dis]sements, les arrondissements en communes et les communes en sections [rura]les L'agglomeration comprenant les habitations l ecole l eglise le [mar]ché etc — en un mot, le village — est presque inconnue dans les [cam]pagnes haïtiennes Il n'y a pas de communautés rurales les maisons [sont] parfois distantes les unes des autres de 1 a 2 kilometres

Le Service d'eradication du pian

Ce service est le resultat des efforts conjugues du Gouvernement haitien de l OMS et du FISE Il est dirige par un Haitien et releve directement du Departement de la Sante , le FISE et l OMS accordent une aide finan

* Cet article sera reprodu t accompagné d un résumé en espagnol dans le *Boletín de la Ofic na Sani a ia [P]anameri ana*

[a] Directeur nat onal de la campagne ant p anique

[b] Médecin-consultant en chef FISE/OMS actuellement D recteur ad o nt du Venereal D sease [Re]search Laboratory Staten Island N Y Etats Un s d Amérique

[c] Consultant techn que

[d] Consultant adjo nt Médec n rés dent du N J Valley View Sanatorium Etats Unis d Amérique

ciere et technique Il comprend un personnel administratif et un personnel technique Ce dernier est recrute parmi des jeunes gens de 22 à 35 ans, qui reçoivent un entrainement de quinze jours à l Hopital general au Bureau central et dans les dispensaires mis a la disposition du service par la mission sanitaire de l Institute of Inter American Affairs

Le programme

Un accord signe en juin 1950 entre le Gouvernement haitien et l OMS avait pour but

1) d instituer un programme d eradication du pian en Ha t par le traitement systematique au moyen des antibiotiques

2) de combattre la syphilis rurale par les antibiotiques en eliminant la plupart des sources d infection

3) d evaluer le resultat du traitement du pian et de la syphilis par des enquetes sur le nombre de cas au debut et a la fin de la campagne et par des examens serologiques

4) d instruire le personnel professionnel et auxiliaire dans les methodes d eradication du pian et de lutte contre la syphilis

La campagne d eradication du pian et de lutte contre la syphilis rurale comprend trois phases distinctes

1) le diagnostic et le traitement systematique

2) l etablissement d un systeme adequat pour la decouverte des cas ayant echappe à la premiere enquete

3) l etablissement de dispensaires permanents dans les localites ou la maladie est tres repandue

Le 20 juillet 1950 le Service d eradication a entrepris la premiere phase Le personnel technique comprenait les inspecteurs repartis en tro s equipes ayant les fonctions suivantes *a)* demarcation *b)* tra tement *c)* controle

Les methodes

L equipe de demarcation avisait les autorites militaires civiles et rel gieuses de l arrivee prochaine de l equipe de traitement Les inspecteurs apposaient dans toutes les sections rurales d une commune determ nee des avis indiquant la date de cette arrivee Chacun des inspecteurs composant l equipe de traitement était affecte à une localite Il tenait consultation toute la journee et soignait non seulement les personnes atteintes de p an et de lesions ouvertes mais encore celles qui vivaient en contact avec les malades (« contacts ») L inspecteur se deplaçait chaque jour suivant un itineraire fixe L equipe de traitement sejournait dans un depart ment jusqu a ce qu elle ait visite toutes les sections rurales

Le paysan haïtien même malade, hésite parfois à se présenter à la consultation. C'est pourquoi le service d'éradication a institué l'équipe

y séjourne jusqu'à ce qu'il ne trouve plus aucun cas de pian infectieux.

Comme on l'a vu plus haut, le Service d'éradication du pian au début de la campagne n'avait aucune donnée précise sur le chiffre de la population d'Haïti. Le recensement national n'a commencé qu'en août 1950 et le premier dénombrement a été publié en novembre 1950. Grâce aux données du recensement national, le service a pu constater que, par la méthode de consultation journalière 70% seulement des personnes des régions déjà visitées avaient bénéficié du traitement. Il a donc adopté en octobre 1951 une nouvelle méthode dénommée « de maison en maison ». Cette nouvelle méthode obligeait le service à organiser deux sections : une section de cartographie et une section de traitement.

Les inspecteurs de la section de cartographie, sous la direction d'un inspecteur général, font une délimitation de toutes les sections rurales d'une commune. En même temps ils avisent les autorités civiles, militaires et religieuses de l'arrivée de l'équipe de traitement.

Au jour fixé par l'équipe de cartographie, l'inspecteur de l'équipe de traitement commence ... Il est ... qu'il ... 1 000 ... L'inspecteur passe de maison en maison. Il assigne à chaque maison un numéro d'ordre, il établit une fiche pour chaque personne et indique la dose de pénicilline injectée. Si un habitant de la maison est absent, l'inspecteur remplit la fiche de celui-ci selon les renseignements fournis par les autres habitants de la maison, en les priant d'aviser l'absent qu'il est à sa disposition à n'importe quel moment. L'inspecteur est forcé de travailler le soir et le dimanche, car il arrive souvent que les absents se présentent à ce moment là. D'ailleurs, dans la majorité des cas, les absents sont des individus en bonne santé, qui se trouvaient aux champs ou au marché. Ils sont soignés comme « contacts ». Nous ne signalons même pas les cas de refus, qui sont très rares, tant est vif l'enthousiasme du paysan à se faire soigner. L'inspecteur passe dix à douze jours dans une localité traitant 96 à 100 personnes par jour. La méthode est lente, elle est même fatigante car les habitations sont éloignées les unes des autres. Cependant elle présente de grands avantages :

a) elle permet de soigner plus de 95% des personnes d'une localité ;

b) elle met l'inspecteur en contact direct avec le paysan qui peut ainsi profiter de ses conseils d'hygiène ;

c) elle évite le gaspillage de la pénicilline (aucun sujet n'est soigné deux fois ce qui arrivait souvent avec l'ancienne méthode).

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1) d'instituer un programme d'éradication du pian en Haïti par le traitement systématique au moyen des antibiotiques ,

2) de combattre la syphilis rurale par les antibiotiques en éliminant la plupart des sources d'infection ,

3) d'évaluer le résultat du traitement du pian et de la syphilis par des enquêtes sur le nombre de cas au début et à la fin de la campagne et par des examens sérologiques ,

4) d instruire le personnel professionnel et auxiliaire dans les méthodes d éradication du pian et de lutte contre la syphilis

La campagne d'éradication du pian et de lutte contre la syphilis rurale comprend trois phases distinctes

1) le diagnostic et le traitement systématique ,

2) l établissement d'un système adéquat pour la découverte des cas *ayant échappé à la première enquête* ,

3) l établissement de dispensaires permanents dans les localités où la maladie est très répandue

Le 20 juillet 1950, le Service d éradication a entrepris la première phase Le personnel technique comprenait les inspecteurs répartis en trois équipes, ayant les fonctions suivantes *a)* démarcation, *b)* traitement *c)* contrôle

Les méthodes

L équipe de démarcation avisait les autorités militaires, civiles et religieuses de l'arrivée prochaine de l'équipe de traitement Les inspecteurs apposaient dans toutes les sections rurales d'une commune déterminée des avis indiquant la date de cette arrivée Chacun des inspecteurs composant l'équipe de traitement était affecté à une localité Il tenait consultation toute la journée et soignait non seulement les personnes atteintes de pian et de lésions ouvertes, mais encore celles qui vivaient en contact avec les malades (« contacts ») L inspecteur se déplaçait chaque jour suivant un itinéraire fixé L équipe de traitement séjournait dans un département jusqu à ce qu'elle ait visité toutes les sections rurales

Le paysan haitien meme malade hesite parfois a se presenter à la consultation C est pourquoi le service d eradication a institue l equipe de controle qui a pour tache de depister et de soigner tous les cas infectieux qui ont echappé au traitement L inspecteur de l equipe de contrôle arrive dans une localite trois mois après le passage de l equipe de traitement Il y sejourne jusqu a ce qu il ne trouve plus aucun cas de pian infectieux

Comme on l a vu plus haut le Service d éradication du pian au debut de la campagne n avait aucune donnee precise sur le chiffre de la population d Haïti Le recensement national n a commence qu en aout 1950 et le premier dénombrement a ete publie en novembre 1950 Grâce aux données du recensement national le service a pu constater que par la methode de consultation journalière 70% seulement des personnes des regions deja vis tees avaient beneficie du traitement il a donc adopte en octobre 1951 une nouvelle methode denommee « de maison en maison » Cette nouvelle methode obligeait le service a organiser deux sections une section de cartographie et une section de traitement

Les inspecteurs de la section de cartographie sous la direction d un inspecteur général font une delimitation de toutes les sections rurales d une commune En meme temps ils avisent les autorites civiles militaires et religieuses de l arrivee de l equipe de traitement

Au jour fixé par l équipe de cartographie l inspecteur de l equipe de traitement commence le travail dans la localite qui lui est assignee Il est pourvu d une carte detaillee de cette localite Il y sejourne jusqu a ce qu il ait soigne tous les habitants de son secteur qui comprend au moins 1 000 personnes L inspecteur passe de maison en maison Il assigne a chaque maison un numero d ordre il etablit une fiche pour chaque personne et indique la dose de penicilline injectée Si un habitant de la maison est absent l inspecteur remplit la fiche de celui ci selon les renseignements fournis par les autres habitants de la maison en les priant d aviser l absent qu il est a sa disposition à n importe quel moment L inspecteur est force de travailler le soir et le dimanche car il arrive souvent que les absents se presentent à ce moment la D ailleurs dans la majorite des cas les absents sont des individus en bonne sante qui se trouvaient aux champs ou au marche Ils sont soignes comme « contacts » Nous ne signalons même pas les cas de refus qui sont tres rares tant est vif l enthousiasme du paysan à se faire soigner L inspecteur passe dix a douze jours dans une localité traitant 96 à 100 personnes par jour La methode est lente elle est meme fatigante car les habitations sont eloignees les unes des autres Cependant elle présente de grands avantages

a) elle permet de soigner plus de 95% des personnes d une localité

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c) elle evite le gaspillage de la penicilline (aucun sujet n est soigne deux fois ce qui arrivait souvent avec l ancienne methode)

Dose

En vue du diagnostic et du traitement systematique, le service d'eradication a reparti les personnes a soigner en deux grandes categories

a) les malades (tous ceux qui presentent le pian infectieux, avec pianomes et lesions ouvertes (ulceres, plaies)),

b) les « contacts », c'est à dire ceux qui vivent en contact permanent avec les malades

Comme les enfants sont assez souvent exposes a l'infection, ils sont tous soignés, de 0 à 16 ans Les malades reçoivent 2 ml (600 000 unites) de penicilline huileuse procaînee avec 2% de monostearate d aluminium Les contacts et les enfants jouissant d'une bonne sante reçoivent 1 ml (300 000 unites) de penicilline

Nos inspecteurs ont injecte, du 20 juillet 1950 au 31 octobre 1951, 991 480 ml a 642 238 personnes et du 27 octobre 1951 au 31 mai 1952, 542 693 ml a 358 999 personnes

La question de l'efficacité de cette dose est traitée ailleurs par Levitan *

Resultats

Le paysan haitien est mefiant, hésitant Il ne croit que les faits Son enthousiasme à se faire soigner suffirait a prouver l'efficacite du traitement Autrefois les dispensaires ne desemplissaient pas Aujourd hui, les paysans attendent patiemment l'arrivee de l'inspecteur, et quand celui ci doit s'absenter, ils parcourent plusieurs kilomètres pour le retrouver et beneficier du traitement Il est vrai que les resultats sont merveilleux Au 3e jour apres le traitement, le malade sent une reelle detente, au 4e jour, la dessiccation commence, pour etre complete au 6e ou 7e jour En moins de huit jours les crabes humides sont entièrement desseches, les douleurs osteocopes disparaissent et les malades immobilises depuis des annees reprennent leurs activites

Une fois acheve le traitement systematique dans le Departement du Sud la deuxieme phase de la campagne a ete abordee, soit l'etablissement d un systeme adequat pour le depistage des cas echappes aux premieres investigations L Institut de Statistique, prié de préparer le plan d une enquete par sondage dans ce departement, a divise ce dernier en plusieurs zones Quelques localites dans chaque zone sont choisies au hasard Un medecin aide de deux inspecteurs y est envoye Le depistage des malades est fait par les inspecteurs qui envoient les cas suspects au medecin Celui ci procede a l'examen microscopique sur fond noir des secretions provenant des pianomes Les fiches des malades sont expediées à l Institut de Statistique Les resultats de l enquête commencee au mois de mars 1952

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* Voir page 55

sont rassembles dans les tableaux I à XIII Il faut noter que l'incidence du pian etait tres elevee dans les regions considerees

Conclusion

D'aprés le recensement national, la population d'Haiti est surtout rurale (environ 87% de la population totale vit dans les campagnes), le pays est essentiellement agricole, et le pian n'atteint que la population rurale Il constitue un veritable fleau pour la nation qui ne deviendra vraiment florissante que si le mal est eliminé Le terme eradication employe ici ne signifie pas elimination complete du mal en un temps donne En effet, il n'y a pas de methode pratique pour traiter une population en un temps determiné Il n'y a pas non plus de traitement par injection unique susceptible de provoquer une guérison définitive Le Service d'eradication est certain qu'apres l'exécution du programme actuel, il restera de petits foyers d'infection un peu partout dans l'ile, c'est pourquoi il est d'une importance capitale d'etablir des centres de diagnostic et de traitement sur toute l'étendue de l'ile, en des points strategiques, car l'éradication au vrai sens du mot est le resultat d'un effort continu, une œuvre de longue haleine Mais le remède existe, et le pian peut enfin etre combattu avec succes

ENQUÊTE SUR LA FRÉQUENCE DU PIAN DANS LE DÉPARTEMENT DU SUD DE HAÏTI

TABLEAU I ZONE I — SECTION RURALE DÉSORMEAU

Habitants	Hommes	Femmes	Enfants	Total
Personnes rencontrées	152	217	276	645
Infection diagnostiquée	80	177	228	485
Infection supposée	—*	1	[illegible]	[illegible]
Traitement antérieur		*	*	2
Personnes absentes	72	40	48	160
Infection supposée	—			—*
Traitement antérieur supposé	—			

* Aucune information

TABLEAU II ZONE I — SECTION RURALE BARIADELLE

	Hommes	Femmes	Enfants	Total
Habitants	213	217	145	575
Personnes rencontrées	165	165	125	475
Infection diagnostiquée	1	—	—	1
Infection supposée	1	1	3	5
Traitement antérieur	—*	—*	—*	—*
Personnes absentes	48	32	20	100
Infection supposée	—	—	—	—
Traitement antérieur supposé	—	—	—	—

* Aucune information

TABLEAU III ZONE I — SECTION RURALE CHAMBELLAN

	Hommes	Femmes	Enfants	Total
Habitants	165	210	295	670
Personnes rencontrées	97	161	242	500
Infection diagnostiquée	—	—	—	—
Infection supposée	—	—	—	—
Traitement antérieur	84	149	193	431
Personnes absentes	68	49	53	170
Infection supposée	—	—	4	4
Traitement antérieur supposé	68	43	46	157

TABLEAU IV ZONE I — SECTION RURALE BALIVERNE

	Hommes	Femmes	Enfants	*Total*
Habitants	192	223	369	784
Personnes rencontrées	72	145	277	494
Infection diagnostiquée		—	1	1
Infection supposée		3	4	7
Traitement antérieur	66	136	244	446
Personnes absentes	120	78	92	290
Infection supposée	—	—	—	—
Traitement antérieur supposé	117	77	88	282

TABLEAU V ZONE I — VILLE DE BONBON

	Hommes	Femmes	Enfan s	Total
Hab tants	44	18	190	516
Personnes rencont ées	99	72	165	436
Infection d agnost quée				
Infect on supposée	—	—		
Tra tement anté eur	90	156	132	378
Personnes absentes	45	10	5	80
Infect on supposée	—	—		
T a tement anté eur supposé	42	9	20	7

TABLEAU VI ZONE I — VILLE DES ROSEAUX

	Hommes	Femmes	Enfants	Tota
Hab tants	1 5	42	17	4 8
Personnes rencontrées	75	[illegible]	163	360
Infect on d agnost quée	1	—		1
nfection supposée	—	1	2	3
Tra tement anté eu	66	08	39	3 3
Personnes absentes	40	0	8	68
Infect on supposée	—	—	—	
T a tement anté eur supposé	37	15	8	6

TABLEAU VII ZONE I — VILLE DES ABRICOTS

	Hommes	Femmes	Enfants	To a
Hab tants	149	204	[illegible]	579
Personnes rencontrées	94	[illegible]	203	48
Infect on d agnos quée	—			
Infect on supposée	1			
T a tement anté eu	94	175	85	454
Personnes absentes	[illegible]	9	23	97
Infect on supposée	—	—	—	
Tra tement antér eu supposé	53	10	21	93

TABLEAU VIII. ZONE I — ANSE-DU-CLERC

	Hommes	Femmes	Enfants	Total
Habitants	158	171	273	602
Personnes rencontrées	95	139	242	476
Infection diagnostiquée	—	—	—	—
Infection supposée	1	—	1	2
Traitement antérieur	82	121	211	414
Personnes absentes	63	32	31	126
Infection supposée	—	—	—	—
Traitement antérieur supposé	60	29	28	117

TABLEAU IX. ZONE II — SECTION RURALE VÉRONE

	Hommes	Femmes	Enfants	Total
Habitants	173	212	305	690
Personnes rencontrées	93	180	289	562
Infection diagnostiquée	1	—	2	3
Infection supposée	—	—	—	—
Traitement antérieur	84	103	238	425
Personnes absentes	80	32	16	128
Infection supposée	1	—	1	—
Traitement antérieur supposé	74	32	15	121

TABLEAU X ZONE II — SECTION RURALE RANDEL

	Hommes	Femmes	Enfants	Total
Habitants	156	195	279	630
Personnes rencontrées	110	173	264	547
Infection diagnostiquée	5	1	7	13
Infection supposée	1	—	—	1
Traitement antérieur	61	121	171	353
Personnes absentes	46	22	15	83
Infection supposée	—	—	—	—
Traitement antérieur supposé	37	15	15	67

TABLEAU XI ZONE II — SECTION RURALE MELONNIÈRE

	Hommes	Femmes	Enfants	Total
Habitants	194	256	368	818
Personnes rencontrées	131	209	329	669
Infection diagnostiquée	2	2	2	6
Infection supposée	—	—	—	—
Traitement antérieur	77	91	130	298
Personnes absentes	63	47	39	149
Infection supposée	—	—	—	—
Traitement antérieur supposé	35	24	19	78

TABLEAU XII ZONE II — SECTION RURALE SOLON

	Hommes	Femmes	Enfants	Total
Habitants	166	207	250	623
Personnes rencontrées	100	167	208	475
Infection diagnostiquée	2	—	1	3
Infection supposée	—	1	—	1
Traitement antérieur	34	68	86	188
Personnes absentes	66	40	42	148
Infection supposée	—	—	—	—
Traitement antérieur supposé	24	25	20	69

TABLEAU XIII ZONE II — SECTION RURALE CARREFOUR CANOT

	Hommes	Femmes	Enfants	Total
Habitants	147	206	233	636
Personnes rencontrées	73	149	226	448
Infection diagnostiquée	2	4	2	8
Infection supposée	—	—	1	1
Traitement antérieur	45	81	110	236
Personnes absentes	74	57	57	188
Infection supposée	1	—	—	1
Traitement antérieur supposé	46	36	30	112

SUMMARY

The authors describe the activities of the Yaws Eradication Service which was initiated in Haiti in 1950 by the Haitian Government, with technical aid from the United Nations International Children's Emergency Fund (UNICEF) and WHO The anti yaws campaign was to consist of three phases *diagnosis and treatment*; detection of cases which were missed at the time of the first investigation, and the establishment of permanent clinics in regions of high endemicity The third phase is still in the planning stage

The Republic of Haiti, a very mountainous and wholly agricultural country, possesses no main roads Its rural habitations are not grouped in villages but are widely scattered In such circumstances, the first method of mass treatment, which consisted of holding consultations for one whole day in each locality, succeeded in reaching only 70% of the population A second method was then tried each "treatment unit" inspector, provided with a detailed map by the "cartography unit", made house-to house visits, drew up records for every member of every household, and sought information on absent members In this way, 95% of the population was reached

Treatment consisted of a single injection of procaine penicillin in oil with 2% *aluminium monostearate Doses of 2 ml* (600,000 units) were administered to all positive reactors, and of 1 ml (300 000 units) to all contacts and all healthy children Excellent results were obtained in one week, all open lesions were healed, which aroused the enthusiasm of the people

In order to establish some kind of system for discovering cases which had eluded the first visit, the Yaws Eradication Service, beginning in *March 1952*, carried out a sampling survey in one of the Departments of Haiti Thirteen tables give the results of the survey in as many localities

RÉSUMÉ

Les auteurs décrivent les activités du Service d'éradication du pian, créé en Haïti, en 1950, par le Gouvernement haïtien avec l'aide technique du Fonds International de Secours à l Enfance (FISE) et de l'OMS La campagne anti pianique devait comprendre trois phases *diagnostic et traitement, dépistage des cas* ayant échappé à la première investigation et installation de dispensaires permanents dans les régions de forte endémicité Cette dernière phase est encore en projet.

La République de Haïti, fort montagneuse, uniquement agricole, est dépourvue de grandes routes Les habitations rurales n'y sont pas groupées en villages, mais éloignées les unes des autres Dans ces conditions, une première méthode pour le traitement en série, qui consistait à tenir consultation un jour entier dans chaque localité, ne reussit à toucher que 70% de la population Une autre méthode fut alors *essayée* : chaque inspecteur de la « section de traitement », muni d une carte détaillée, préparée par la « section de cartographie », se rendait lui même de maison en maison, établissait une fiche pour chacun des habitants de la maison et s'enquerait aussi des absents On parvint ainsi à traiter 95% de la population

Le traitement comprenait une seule injection de pénicilline huileuse procaïnée *avec 2% de monostearate* d aluminium On administrait 2 ml (600 000 unités) a tous les pianiques, 1 ml (300 000 unités) à tous les sujets contacts et à *tous les*

a suscité l'enthousiasme des paysans

En vue de préparer un système de dépistage des cas échappés à la première visite le Service d'éradication a effectué ensuite à partir de *mars* 1952, une enquête par sondages dans un département de Haïti Des tableaux indiquent *les résultats* de l'enquête dans 13 localités

The article provides a precise and detailed illustration of the way in which an effective anti-yaws (or antisyphilis) campaign may be carried out in a rural area with a scattered population

L'article fournit un exemple précis et détaillé de la façon dont on peut organiser une campagne efficace contre le pian (ou la syphilis) dans une région rurale aux habitations dispersées

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EXPERIENCE WITH YAWS CONTROL IN INDONESIA

Preliminary Results with a Simplified Approach

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Attempts to control yaws by mass treatment have been under study in Indonesia since 1919 The first attempts, based on the use of arsenicals, were sporadic and incompletely planned and were never carried through to completion, even in areas with an exceedingly high prevalence of the disease

Systematic yaws-control activities, in which the need for adequate coverage of the population was stressed, date from 1934, but the work was interrupted by the Japanese occupation and the subsequent movement for independence The work could not be resumed until October 1949, when systematic efforts were again started in the province of Jogjakarta In May 1950, WHO and UNICEF gave their support to the yaws-control work, and the programme has since been developing rapidly

Up to the present, two different methods have been used (1) the treatment of active yaws cases with arsenicals in the policlinics, and (2) the method of Kodijat which depends on the use of field teams The first of these methods does not cover a sufficiently high proportion of the population and has the disadvantages inherent in the use of a potentially toxic drug Kodijat s approach is efficient and scientifically sound, but it has the disadvantage of being expensive and requiring a large, trained staff For these reasons a new method of approach had to be found if a nation-wide programme were to be developed In 1951, a simplified approach to yaws-control was suggested, and a pilot study was started in three sub-districts in East Java The preliminary results of this pilot study are reported herein

The " Treponematoses-Control Project, Simplified " (TCPS)

The new programme, called the " Treponematoses Control Project Simplified ", was based on the following considerations

(1) The anti yaws campaign must become a routine part of the daily duties of the health units working in sub-districts

(2) The area to be covered is the sub district, which has an average of 25,000 inhabitants

(3) The centre of work is the sub district policlinic The key personnel are the nurse and his assistant, specially trained staff being unnecessary Buildings already available are used

(4) Control work is not carried out four weeks after the first injection as was the case with the earlier projects, but rather re survey and follow up are done after the entire sub district has been examined and treated

The objectives of the TCPS are similar to those of the Kodijat method

(*a*) screening of as close to 100% of the population as possible, in order to detect all framboesia patients,

(*b*) treatment of framboesia patients with two injections of PAM,

(*c*) use of control checks and follow up examinations, and

(*d*) adoption of a simplified method of administration

Selection of the village population for treatment is the task of the assistant nurse, known as a ' djuru patek ' The " djuru patek ", who is attached as an assistant to the qualified nurse in charge of a sub-district policlinic, has served as an apprentice for a certain period of time learning his elementary duties through active participation in the daily work The nurse and his assistant receive a further four weeks' training on how to organize the sub district campaign, how to diagnose cases of yaws and how to draft reports

So far as training and general knowledge are concerned, the " djuru patek is far inferior to the well trained team nurse It is therefore to be expected that he will not be so exact in his diagnosis

Initial survey

The first area in which the TCPS was put into practice was the sub district of Drijo situated 25 km (15½ miles) from Surabaya, covering an area with a population of about 19,000

This sub district can be divided into two parts one is situated along the Surabaya river, with rich well irrigated rice fields, the other rising to Kendeng hill is a poor area where there is a constant shortage of water and irrigation of the rice fields is dependent on the rain

The first examination carried out in this sub-district began on 1 October 1951 and was originally scheduled to end on 1 April 1952, it was actually completed on 18 February 1952 A total of 16,659 persons were examined representing 87 2% of the entire population The initial examination and treatment phase were completed in 18 weeks on a total of 72 examination days, an average of 926 persons was examined each week, 231 persons each day

TABLE I CASES FOUND DURING SURVEY AND RE SURVEY IN THE VILLAGE OF BANDJARAN SUB DISTRICT OF DRIJO

Popu lat on *	Exam ned		0 5 months			6 months 2 years			3 10 years			11 18 years			over 19 years			Total			
	number	%	M **	F †	T ††	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	%
survey																					
1 837	1 632	89	—	—	—	9	5	14	66	44	110	45	31	76	70	77	147	190	157	347	21
re-survey																					
1 814	1 667	92	—	—	—	—	—	—	20	15	35	19	5	24	17	20	37	56	40	96	6

* People earning their living elsewhere excluded
** M male
† F female
†† T = total

Re-survey

In view of the increasingly important part played by the TCPS in the further expansion of the nationwide campaign we were eager to know the results of this pilot experiment

Two adjacent villages in the sub district were selected for the first re-survey—Bandjaran and Karangandong, with a yaws prevalence of 22% and 16% respectively The initial examination and treatment phase in Bandjaran was finished on 10 December 1951, and the re survey was begun on 5 May 1952 In Karangandong, examination and treatment were completed on 17 December 1951, and the re-survey was begun on 20 May 1952 The interval between the first examination and re-survey was thus five months in each case The re survey was conducted by the present writers Cases found were discussed and analysed on the spot

Results

The average prevalence of yaws found during the initial survey was 10 2% for the total population four villages having above 15% of cases The detailed results obtained during the initial survey and the re survey in the villages of Bandjaran and Karangandong are given in tables I VI

TABLE II CASES OF INFECTIOUS YAWS FOUND DURING SURVEY AND RE SURVEY IN THE VILLAGE OF BANDJARAN SUB DISTRICT OF DRIJO

Examination at	Population	Examined		0-5 months	6 months 2 years	3 10 years	11 18 years	Over 19 years	Total
		number	%						
Survey	1 837	1 632	89	—	13	60	30	31	134
Re survey	1 814	1 667	92	—	—	15	2	8	25

It can be seen from these tables that in the course of five months the prevalence of yaws in Bandjaran and Karangandong was considerably reduced The number of infectious cases fell from 134 and 111 to 25 and 26 respectively

Cases have been seen where lesions in the soles completely vanished However, the recognition of alterations of the sole and the evaluation of the influence of treatment upon these lesions will always be a difficult matter in field diagnosis If the evaluation is carried out by different persons, different conclusions may be reached

It can be argued that the diagnosis of the "djuru *patek*" may not have been accurate, and this, of course, would influence the results So far as we could observe, however, during the campaign as well as during the follow-up, the errors made by these assistants were negligible

TABLE III RESULTS OBTAINED IN 323 CASES TREATED AND RE EXAMINED AFTER FIVE MONTHS

Number of cases found at in t al survey			Number of patients followed up			Status after 5 months (May 1952)												Re nfection/ relapse			
						cured				improved				not mproved							
M *	F **	T †	M	F	T	M	F	T	%	M	F	T	%	M	F	T	%	M	F	T	%
190	157	347	178	145	323	163	135	298	92.3	6	5	11	3 4	6	5	11	3 4	3	—	3	0 9

* M = male
** F = female
† T = total

TABLE IV CASES FOUND DURING SURVEY AND RE SURVEY IN THE VILLAGE OF KARANGANDONG, SUB-DISTRICT OF DRIJO

Popu lation *	Examined		0 5 months			6 months 2 years			3 10 years			11 18 years			over 19 years			Total			
	number	%	M **	F †	T ††	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	%
									survey												
1 385	1 267	92	—	—	—	4	7	11	43	27	70	16	12	28	55	45	100	118	91	209	16
									re-survey												
1 365	1 349	94	—	—	—	1	2	3	17	12	29	13	2	15	9	13	22	40	29	69	5

* People earning their living elsewhe e excluded
** M = male
† F = female
†† T = total

TABLE V CASES OF INFECTIOUS YAWS FOUND DURING SURVEY AND RE SURVEY IN THE VILLAGE OF KARANGANDONG SUB DISTRICT OF DRIJO

Examination at	Population	Examined number	Examined %	0 5 months	6 months 2 years	3 10 years	11 18 years	Over 19 years	Total
Survey	1 385	1 267	92	—	10	53	12	36	111
Re survey	1 365	1 349	94	—	3	12	7	4	26

Although the results obtained are of sufficient interest to warrant their use for the purpose of study, they should not be regarded as unquestionably accurate Cases are described as "improved when the subjective complaints lessen or wholly disappear, although the *objective symptoms are* still present, e g, clavus like local hyperkeratosis "Not improved covers cases where absolutely no improvement was found

An analysis of the cases followed up showed that 93% were cured Only a small number of the remaining cases were re treated

For the most part the cases found during the re survey were either latent cases which were examined during the initial survey but had no symptoms at that time, or persons who were not examined during the initial survey and were found to have yaws during the re survey

New cases" are recent infections which commenced in the course of these five months with the development of primary yaws followed by early *secondary efflorescences During the initial survey these cases were probably* either in the incubation stage or not yet infected The children born after the initial survey were all still free from infection when the re survey was carried out

The results achieved in the campaign depend on the level of attendance attained If the campaign is well organized a greater number of people will be examined and a high number of latent cases will be found If the number of inhabitants staying away is high, these latent cases will not be found and will produce infectious relapses resulting in a wider spread of infection Latent cases which are free from symptoms when the initial examination is carried out constitute therefore, the greatest potential *danger so far as the spread of infection is concerned*

Treatment schedule

The treatment schedules adopted were the same as those used elsewhere in the Indonesian treponematosis control programme, these are as follows

Age (years)	*Dosage (units of PAM)*
under 3	600 000 in 2 equal injections
3 10	1 200 000 in 2 equal injections
11 and over	2 400 000 in 2 equal injections

TABLE VI RESULTS OBTAINED IN 190 CASES TREATED AND RE-EXAMINED AFTER FIVE MONTHS

Number of cases found at initial survey			Number of patients followed up			Status after 5 months (May 19 2)												Reinfection/relapse			
						cured				improved				not improved							
M*	F**	T†	M	F	T	M	F	T	%	M	F	T	%	M	F	T	%	M	F	T	%
1 8	91	209	107	83	190	98	81	179	94	6	1	7	4	3	1	4	2		—	—	—

* M = male
** F = female
† T = total

In order to determine the serological response to these treati schedules, a serological and clinical follow up investigation was cond in four villages of the Ngandjuk area in 1951 No relapses were f during that year

The results of the serological follow up differ from those of investigators Only 65 8% of the people originally examined attende re survey The results were as follows

serological cure	7 5%
serological improvement	58%
serological fastness	32 8%

In this investigation children below 10 years of age were exclu and the people who stayed away at the re-survey appeared to be adolescents The investigations are continuing

Experience may show that the dosages adopted can be reduced, the period of observation has been too short to draw definite conclus at the moment We prefer to support the opinions of the expert consult R V Rajam, C J Hackett, and K R Hill, who have stated in unpublished report on the treponematosis control activities in Indo that "definite conclusions cannot be drawn from the results of only year (the first year) of the campaign More knowledge is still needed a the most effective way to use the drug"

Evaluation work is being done in Indonesia Sardadi is carrying experiments on different treatment schedules in Jogjakarta, while in Java it is planned to introduce a single injection schedule of 1,800,000 u of PAM The further expansion of the campaign in Indonesia will be ba on the results of these experiments

Epidemiology

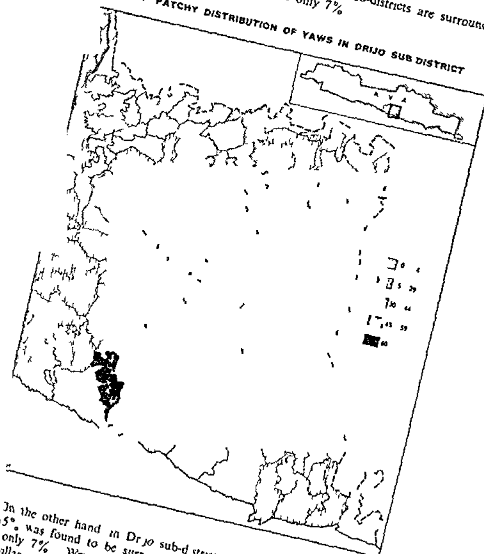
Geographical distribution of yaws

When mapping out the prevalence of yaws in the Drijo sub distr we noticed that its distribution in this area is similar to that found e where in Indonesia or, in fact, anywhere in the tropics It is well kno that the distribution of yaws is patchy, areas and villages with a h prevalence adjoining those with a low (see fig 1)

A similar picture appeared after the Drijo survey, when the adjac sub district, Wringin-Anom, was also examined Drijo sub district has average prevalence of 10%, Wringin Anom one of 7% The villa of Bandjaran and Karangandong adjoin two villages of the Wringin Anc sub district with a prevalence of 14% and 20% respectively North this group of four villages lies Widoro Anom where the prevalence is 19

The areas with a high prevalence in both sub-districts are surrounded by villages where the prevalence is only 7%

FIG 1 PATCHY DISTRIBUTION OF YAWS IN DRIJO SUB DISTRICT



On the other hand in Drijo sub-district a village with a prevalence ·· 15% was found to be surrounded by villages where the prevalence was only 7% Wringin Anom sub district shows a similar situation one village with a 14% prevalence was found to be surrounded by villages with an average of only 5%

Distribution of infectious forms of yaws by age group

The results of our survey show that the group 3 10 years of age has the highest percentage of infectious cases the next highest being the group 11 18 years old Theoretically these should be the age groups constituting the greatest potential danger to others Outdoor contact within these age groups is not, however, always the same and it was felt that a further study should be made to determine the influence of this outdoor contact on the spread of disease

As the data in the villages of Bandjaran and Karangandong were insufficient the results of the survey in the sub district of Gondang (Ngandjuk area) were analysed There were 2 415 infectious cases of which 95 were of primary lesions 1 526 of secondary papillomata and 794 of palmar and plantar papillomata

It was decided to use a method of division into age-groups different from that usually adopted In this case the division was made more in accordance with the various periods of village life as this seemed more logical from an epidemiological point of view, and showed more clearly the different kinds of contact This division is as follows

Age (years)	*Period*	*Type of contact*
under 2	baby	household
2 6	" toddler "	household and hamlet (neighbourhood)
6-12	school age	household school hamlet and village
12 18	adolescent	household hamlet and village
18 and over	adult	predominantly household as people grow older outdoor contact gradually decreases and household contact becomes more intensive

In fig 2 the distribution by age group is shown During the " baby period cases of primary lesions are the most frequent, followed by the secondary papillomata with wet crab or palmar and plantar papillomata forming the smallest group The greatest number of primary lesions is to be found in the toddler period (2 6 years) and the lowest in th adolescent period (12 18 years) The most numerous cases of secondary papillomata also appear in the toddler period

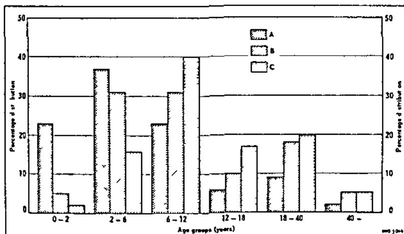
The palmar and plantar papillomata are rare in the "baby" period and reach the peak incidence in the toddler period After that their frequency falls and reaches its lowest point during the adolescent period to remain during the later years of life the most frequent form of yaws

All three rates rise slightly after the lowest point during adolescence and reach a second peak during the adult period The fall during the adolescent period may be explained by the clinical course of yaws

With yaws as well as with syphilis the rule prevails that the longer the period from the onset of infection, the more rare the infectious relapses

As far as the secondary increase during the adult period is concerned, no explanation for it has yet been found by the authors Levitan in Haiti has, however, also noted the existence of this phenomenon [1]

FIG 2 PREVALENCE OF YAWS AT VARIOUS STAGES ACCORDING TO AGE



A = Primary lesions (95 cases)
B = Papillomata (1,526 cases)
C = Palmar and plantar papillomata (794 cases)

This analysis shows that the period of greatest infectiousness is during the school age years, with the "toddler" period taking second place The onset of infection is most frequent in the "toddler" period, and begins a little earlier

It is known that outdoor contact, particularly among boys, is greatest in the school-age period With girls the situation is different, as the older they become the more they will be occupied with household matters, and outdoor contact will gradually lessen Added to this is the fact that at school age the children are most exposed to traumata (during their games, when climbing or looking after cattle, etc), and many often walk about with open wounds and skin diseases It is therefore understandable that the chances of outdoor infection must be greatest at school age The boys of the village community are therefore more prone to infection (household and outdoor contact) than the girls, a fact which explains the preponderance of cases among males

[1] See paper by Levitan et al on page 55

Role of outdoor contact in the spread of yaws

Much has already been written about the part that outdoor contact can play in the spread of infectious skin-diseases in Indonesia Soetopo drew attention to this mode of transmission and, later, Koeslan [2] wrote a detailed account on the same question, as a result of research work carried out on leprosy in the regency of Lamongan

Koeslan distinguished four kinds of contact in the village household contact, "dukuh" or hamlet (group of households) contact, "dessa" or village contact, and incidental contact The most common form is household contact, hamlet contact and village contact are relatively rare Outdoor contact occurs more often among the male than female members of the family and most frequently among children and adolescents

There is another factor which favours the spread of infection school contact In areas where the incidence of yaws is high and many pupils walk about with open yaws-lesions, the chance of contamination at school must not be overlooked

Factors affecting the spread of yaws

Saunders, Kumm & Rerrie made the following statement on the spread of yaws [3] "Yaws has a widespread, patchy distribution in rural Jamaica Where it is common there are practically always found a heavy rainfall, a fertile, moisture-holding soil supporting an abundant vegetation, a peasant population living under insanitary conditions, and many *H* [*Hippellates*] *pallipes* flies"

Hill states [4] that, in Jamaica, high humidity is associated with a high prevalence of yaws Humidity means the relationship of the following factors rainfall, specific geological formation, and vegetation Yaws is least prevalent in areas where white limestone is present, such areas have scanty soil, are pervious to water, and have sparse vegetation

The general features of the yaws areas in Java are the following they are rural areas with a peasant population, where sanitary conditions are rather poor, where the population lives in great poverty, where there is often a failure of crops, and where famine threatens constantly Such areas are the Kendeng hills in East Java, and Gunung Kidul in the Jogjakarta area

In spite of what has been said about the relationship between yaws on the one hand, and geological formation and climate on the other, the geological formation in the Gunung Kidul area is limestone and marl, and this area, as was pointed out, has a high prevalence of yaws The soil is very dry during the eastern monsoon and has very sparse vegetation,

[2] Koeslan (1938) *Geneesk Tijdschr Ned Ind* 78 1792
[3] Saunders G M Kumm, H W & Rerrie J I (1936) *Amer J Hyg* 23 558
[4] See paper by Hill on page 17

even the banana trees dying from lack of water, while in some regions coconut trees cannot grow During the western monsoon there is an adequate water supply, in some areas even so much so that they become regular flood areas Whether these floods are the result of a non porous soil or of inadequate drainage requires further investigation Certainly there is no superabundance of rain, the average rainfall being no more than 40-50 inches (approximately 1,000-1,250 mm)

In addition to this type of high prevalence area, there are also regions with a different geological formation where the yaws prevalence is no less high, for instance in north Surabaya Neither the geological formation nor the humidity of the soil gives a satisfactory explanation of the prevalence of yaws in regions of Java

Saunders et al are right when they say that there are many variables which might affect prevalence of yaws, including climate, location, vegetation, insect vectors, age and race of the population concerned, their living habits, type of housing, and social, economic, and hygienic level There are indeed many factors which affect the yaws prevalence in any area, but closer study of this question is required before more positive conclusions can be reached

Discussion

The data accumulated during the re-survey show that the speed at which the "djuru patek" works is relatively fast A yaws team, working for four weeks, can examine 6,000 persons. As one team consists of six qualified nurses, one nurse during four weeks can examine 1,000 persons The "djuru patek" can examine approximately 3,700 persons in the same period of time So far as the errors made by the "djuru patek" are concerned, it has already been stated that these may be disregarded As his experience increases, he will become better acquainted with yaws cases and finally achieve the necessary degree of precision

The average attendance attained is 87 55% of the population Both in Bandjaran and Karangandong 90% coverage was achieved during the survey and 95% during the re survey.

These figures are very satisfactory, especially if we bear in mind the fact that in these regions a number of people earn their living in nearby Surabaya, and that, moreover, the area was afflicted by a famine It may therefore be said that in spite of everything the attendance of the population was good

When compared with the needs and expenses of field teams, the equipment required and the administrative costs of the TCPS are very low, and every regency can introduce the system without overburdening its budget

Provided there is a good working plan, the control of yaws can easily be integrated into the regular programme of the public-health service,

and it is not necessary for this work to overshadow other important public-health activities

Meanwhile, interest in the TCPS is growing Although house to house examination has not become a routine part of the work in Java, as many objections were made both by the Civil Service officers and by the inhabitants, the health officers in two sub districts in East Java were obliged to use this method because of local circumstances The results in both areas have so far been very satisfactory

The TCPS can therefore be adapted to local circumstances without any trouble, which proves its flexibility—a necessary requirement when work is done outside Java, where the villages are much more distant from each other, sometimes being as much as a day's journey apart

It is impossible with Kodijat's method to detect infected persons in whom the disease is incubating or is in a state of latency Rajam et al are right when they state that many of the persons free from active yaws at the initial survey had developed infectious lesions by the time the second survey was carried out This suggests that a wider group of persons should be treated Data collected during the re-survey show that the infectious cases, developing after the initial survey, originated mostly from latent cases which were free from symptoms during the initial examination It is therefore the big group of latent cases that requires the most attention The question is how to solve the problem in a simple and practical way We wholly agree with Rajam et al that, apart from the research aspects field campaigns should be made as simple and as economical of manpower as possible

Serological screening of the population would be the most obvious and most accurate solution This method, however simple, cannot be used in a mass campaign, even if the screening is restricted to household contacts of the sources of infection The possible reaction of the population must also be taken into account, as the campaign may be unpopular and poor attendance may result Such difficulties have already been encountered in the regency of Ngandjuk, one of our best areas

Levitan et al [5] in Haiti treated all the members of families in which lesions were found It is known that the spread of infectious diseases in a family is dependent on several factors, all of which are not yet clear Is there any reason to suppose that the opportunity of contact in the family is equal to the chance of infection ? A closer study of this question may produce more data and reveal some interesting facts

Another method used is the treatment of all children up to the age of 16 years either as cases, when they receive 600 000 units of PAM, or as contacts, when they receive 300,000 units If this method were used in Indonesia, it would mean that 40% of the entire population would

[5] See paper by Levitan et al on page 55

have to be treated, i e , about 16 million persons more than the estimated 12 million suffering from yaws

It has been suggested that the question of latency should not cause much trouble because it will be discovered during the re survey We know, however, that in the course of five months latent cases may become active and give rise to several new infections, in fact the number of new infections will increase in proportion to the time which elapses between the initial survey and re-survey

There are two points to which attention must be paid in future work

(1) ascertaining the number of latent cases at the initial survey

(2) determining the proper interval between the initial and follow-up examinations

In the TCPS the time required to undertake a survey in one sub district may be estimated at six to eight months It is possible to begin follow up measures immediately after this period, so that operations will not be hampered unnecessarily and the period between the initial and follow up surveys will be kept within reasonable limits

The first problem, the discovery of latent cases, is, however, not so easy to solve Latent cases and relapses are the consequences of infections previously incurred The line of attack would therefore appear to be to make enquiries into past framboesia infections and to pay strict attention to remaining foci of infection Framboesia is well known among the population, and in an area where it is endemic reliance can be placed on the information collected

We also know that school age, followed by the " toddler " period, are the most dangerous ages for the spread of infection Therefore treatment during the initial survey of every case in the school-age or " toddler " period with a past history of yaws will render harmless a large proportion of the sources of infection For the latent cases in the higher age groups a time limit could be fixed, an infection contracted within a period of five years seems to be a reasonable basis for treatment To acquire some experience with this method, a pilot project will be organized shortly in one or more sub-districts in East Java

Annex I

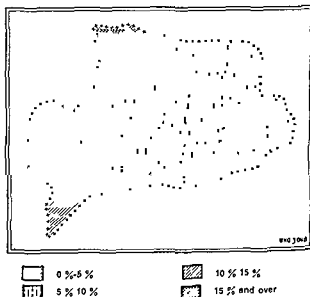
RESULTS OF THE SURVEY AND RE-SURVEY OF THE SUB-DISTRICT OF DRIJO

Since the substance of this paper was communicated to the International Symposium on Yaws Control in Bangkok in March 1952, the re-survey has been continued, and in October 1952 results of both the survey and the re survey were available for 16 villages in the sub-district of Drijo They are given below in tabular form fig 3 and 4 illustrate the prevalence of yaws in the area during the two periods concerned

CASES FOUND DURING THE SURVEY OF THE SUB-DISTRICT OF DRIJO, OCTOBER 1951-MARCH 1952

Village	Population	People examined	Percentage examined	Yaws cases	
				number	%
Drjoredjo	839	751	89	26	3
Bandjaran	1 837	1 632	89	347	21
Karangandong	1 385	1 267	92	209	16
Wedoroanom	1 101	997	90	189	19
Randegansari	1 455	1 192	82	86	7
Gadung	1 033	799	77	60	8
Modjosariredjo	962	789	82	48	6
Sumput	1 389	1 287	92	77	6
Tandjungan	1 520	1 365	89	90	6
Krikilan	1 058	814	76	81	10
Kesambenwetan	1 824	1 493	82	101	7
Pet len	908	842	93	52	6
Tenaru	1 100	1 032	94	86	8
Tjangkir	789	733	93	29	4
Bamboe	959	780	81	68	9
Malung	932	890	95	133	15
Total	19 091	16 663	87	1 682	10

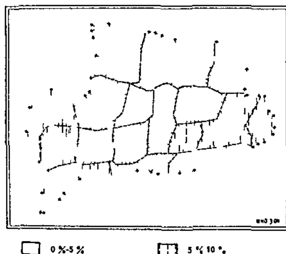
FIG. 3 CASES FOUND DURING THE SURVEY AND RE-SURVEY OF THE SUB-DISTRICT OF DRIJO, OCTOBER 1951—OCTOBER 1952



CASES FOUND DURING THE RE SURVEY OF THE SUB DISTRICT OF DRIJO MAY DECEMBER 1952

V age	Popu lat on	People e am ned: for he 1st t me	e exa m ned	to a numbe	%	Yaws cases: n peop e e a m ned fo t e st t me	n peop e e exa m ned	total numbe	°
D o ed o	8 8	107	598	705	86 7		3	3	0 4
Band aran	1 889	290	1 468	1 758	93 2	30	66	96	5 5
Karangandong	1 457	190	1 162	1 352	92 8	3	56	69	5 1
Wedoroanom	1 10	167	87	1 038	94 3	7	28	35	3 4
Randegansa	373	219	900	9	8 5	0	22	32	2 9
Gadung	1 047	201	647	848	8 0	7	15	22	2 6
Mod osa ed o	998	219	705	9?4	92 6	4	22	26	2 9
Sumput	1 499	211	1 035	246	83	9	33	42	3 4
Tand ungan	1 495	173	1 206	379	92 2	8	27	35	2 5
K k an	995	187	573	760	76 4	13	27	40	5 3
Kesambenwe an	1 79	347	299	646	92 0	4	10	14	0 9
Pet en	903	80	746	8?6	9 4	2	8	0	0.8
Tena u	1 060	212	76	973	9 3	3	40	53	5 4
T angk	795	85	643	728	9 5	2	8	10	0 7
Bamboe	898	4	6?2	769	86 0	11	29	40	5 2
Ma ung	907	03	610	613	90 0	11	38	49	6 1
Total	19 0?8	3 038	13 846	16 884	89 0	144	43?	576	3 4

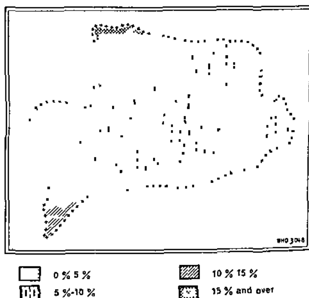
FIG 4 CASES FOUND DURING THE RE SURVEY OF THE SUB DISTRICT OF DRIJO MAY 1952—OCTOBER 1952



CASES FOUND DURING THE SURVEY OF THE SUB-DISTRICT OF DRIJO, OCTOBER 1951-MARCH 1952

Village	Population	People examined	Percentage examined	Yaws cases	
				number	%
Drijoredjo	839	751	89	26	3
Bandjaran	1 837	1 632	89	347	21
Karangandong	1 385	1 267	92	209	16
Wedoroanom	1 101	997	90	189	19
Randegansari	1 455	1 192	82	86	7
Gadung	1 033	799	77	60	8
Modjosariredjo	962	789	82	48	6
Sumput	1 389	1 287	92	77	6
Tandjungan	1 5[illegible]0	1 365	89	90	6
Krikilan	1 058	814	76	81	10
Kesambenwetan	1 824	1 493	82	101	7
Petilen	908	842	93	52	6
Tenaru	1 100	1 032	94	86	8
Tjangkir	789	733	93	29	4
Bamboe	959	780	81	68	9
Malung	932	890	95	133	15
Total	19 091	16 663	87	1 682	10

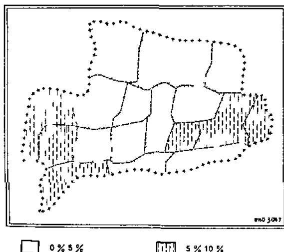
FIG 3 CASES FOUND DURING THE SURVEY AND RE-SURVEY OF THE SUB-DISTRICT OF DRIJO, OCTOBER 1951—OCTOBER 1952



CASES FOUND DURING THE RE SURVEY OF THE SUB DISTRICT OF DRIJO, MAY-DECEMBER 1952

V llage	Popu lation	People examined				Yaws cases			
		for the 1st t me	re exa mined	total number	%	in people exa mined for the 1st t me	in people re exa mined	total number	%
Dnjoredjo	818	107	598	705	86 7	—	3	3	0 4
Bandjaran	1 889	290	1 468	1 758	93 2	30	66	96	5 5
Karangandong	1 457	190	1 162	1 35[illegible]	92 8	13	56	69	5 1
Wedoroanom	1 101	167	871	1 038	94 3	7	28	35	3 4
Randegansarı	1 373	219	900	1 119	81 5	10	22	32	2 9
Gadung	1 047	201	647	848	81 0	7	15	22	2 6
Modjosar red o	998	219	705	9[illegible]4	92 6	4	22	26	2 9
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Tandjungan	1 495	173	1 206	1 379	92 2	8	27	35	2 5
Kr kulan	995	187	573	760	76 4	13	27	40	5 3
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Tena u	1 060	212	761	973	91 3	13	40	53	5 4
T angk r	795	85	643	728	91 5	2	8	10	0 7
Bamboe	898	147	622	769	86 0	11	29	40	5 2
Malung	907	[illegible]03	610	813	90 0	11	33	49	6 1
Total	19 026	3 038	13 846	16 884	89 0	144	432	576	3 4

FIG 4 CASES FOUND DURING THE RE SURVEY OF THE SUB DISTRICT OF DRIJO, MAY 1952—OCTOBER 1952



0 % 5 %   5 % 10 %

SUMMARY

During the past thirty years many attempts have been made to control yaws in Indonesia In 1949 the systematic efforts which had been interrupted during the war years were resumed and in 1951 a new approach to the problem was developed in a pilot study the ' Treponematoses-Control Project, Simplified '—of three sub districts in East Java The objectives of the study were

(*a*) screening of as close to 100% of the population as possible, in order to detect all framboesia patients,

(*b*) treatment of framboesia patients with two injections of PAM,

(*c*) use of control checks and follow up examinations,

(*d*) adoption of a simplified method of administration

In the first survey 16,659 persons (87 2% of the population of the sub-district of Drijo) were examined in 18 weeks The average prevalence of yaws found was 10 2% for the total population, four villages having over 15% of cases The treatment schedules adopted were the same as those used in other Indonesian treponematoses-control activities 600 000 units of PAM were given to those under 3 years of age 1,200 000 units to those between 3 and 10 years of age, and 2 400 000 units to those of 11 years and over The dose was administered in two equal injections The authors consider that the duration of the campaign was insufficient to allow of an evaluation of the treatment schedules, further experiment with various schedules is in progress

The re survey was begun five months later in two adjacent villages where it was found that the prevalence of yaws was considerably reduced, 93% of the cases followed up were cured 90% coverage of the population was achieved during the survey, and 95% during the re-survey A series of tables gives the detailed findings fresh results from the re survey of 16

RÉSUMÉ

Maintes tentatives de lutte antipianique ont été faites en Indonesie au cours des trente dernières années En 1949, après une interruption due à la guerre les travaux reprirent et, en 1951, une etude-type « *Programme simplifié de lutte contre les* tréponématoses » fut entreprise selon une formule nouvelle Le programme etait le suivant

a) examen d'un nombre d'habitants aussi proche que possible de la totalite afin de déceler tous les pianiques

b) traitement des malades au moyen de deux injections de PAM,

c) *vérification des résultats* et *examens* post thérapeutiques,

d) adoption d'une méthode d adminis tration simplifiee

Au cours de la première enquete les *examens, qui s'etendirent sur une periode* de 18 semaines et portèrent sur 16 659 personnes (87,2% de la population du sous district de Drijo) révélèrent une frequence de 10 2% de pianiques par rapport à la *population totale*, quatre villages ayant plus de 15% Les schémas de traitement furent les mêmes que ceux qui avaient éte adoptes dans d autres programmes de lutte antipianique en Indonesie tous les sujets âges de moins de 3 ans reçurent 600 000 unités de PAM, ceux de 3 10 ans 1 200 000 unités et ceux de 11 ans et plus 2 400 000 unités Ces doses ont été administrées en deux injections de même valeur Les auteurs estiment que la campagne fut de trop courte duree pour que l efficacite des schémas de traitement puisse être evaluee D'autres expériences avec differentes posologies, sont en cours

Cinq mois plus tard, on commença les contrôles dans deux villages *adjacents*, la fréquence du pian y était considérable-

villages have become available since the substance of the paper was communicated to the Symposium in March 1952 and are given in an annex

The epidemiological findings of the campaign are discussed in the second part of the paper The geographical distribution of yaws was noted to be similar to that found elsewhere in the tropics A clear epidemiological picture emerged when the data were classified according to age groups reflecting periods of village life and hence opportunities of contact It became apparent that the period of greatest infectiousness is at school age among children between 6 and 12 years old the onset of infection is most frequent in the "toddler" period age-group 2 6 The preponderance of cases among males is caused by the fact that they are at more risk of outdoor contact one of the most frequent sources of infection Distribution of the data according to stage of disease indicates that the greatest number of primary lesions is to be found in the "toddler" period and the lowest in the adolescent period (age group 12 18) The rates for all types of lesion (primary secondary and palmar and plantar) reach a second peak in adult life

The authors were unable to find the same relation that has been noted by other workers between geological formation and climate and the prevalence of yaws in the area under survey There is no superabundance of rain in the limestone and marl area showing a high prevalence and in regions of a different geological formation yaws is almost as frequent The possible influence on prevalence of the many factors such as climate location vegetation insect vectors and age race and living conditions of population requires further study before any positive conclusions can be reached

provenant de 16 villages visités après le Symposium de mars 1952

Les données épidemiologiques relatives à la campagne sont exposees dans la deuxième partie de l article La distribution géographique du pian est la meme qu ailleurs sous les tropiques La classification des données par groupes d âge reflétant les etapes de la vie villageoise et par conséquent les risques d infection par contact met clairement en évidence certains facteurs épidemiologiques On s aperçut ainsi que la periode infectieuse principale est celle de l âge scolaire (6 12 ans) le debut de l infection s observe le plus frequemment chez les bébés qui commencent à marcher et durant le premier âge (2 6 ans) La préponderance de l infection chez les garçons s explique par le fait qu étant plus souvent hors de la maison ils sont plus exposés à certains risques d infection L analyse des données selon le stade d infection et l âge indique que c est durant le premier âge que les lesions primaires sont le plus frequentes, et dans l adolescence (12 18 ans) qu elles le sont le moins Les taux d infection pour chaque stade (primaire secondaire palmaire et plantaire) atteignent un second maximum au cours de l age adulte

Les auteurs n ont pu constater le rapport établi par d autres chercheurs entre la formation geologique et le climat d une part et la fréquence du pian dans la region etudiée On ne constate pas d excès d humidité dans les regions calcaires et marneuses ou le pian est très fréquent la maladie est tout aussi repandue dans les régions d un autre caractère geologique L influence sur l incidence de la maladie de facteurs tels que le climat la situation geographique la végetation les insectes vecteurs l âge la race les conditions de vie demande encore à etre étudiée de façon plus précise avant que des conclusions puissent être formulées

DISCUSSION: PART VI

Chairman Dr M A VAUCEL
Rapporteur Dr F W REYNOLDS

In mass campaigns against yaws, it is not feasible to adhere strictly to all the requirements of ideal medical practice Subprofessional personnel must be used, routine serological testing of all persons cannot be carried out, and in the interests of economy there must be some sort of compromise with optimal therapy It is important to cover as wide an area as possible in a short period of time so that reintroduction of the disease from the periphery will be minimal

The participants in the Symposium recognized that several different drugs were effective against yaws when given orally None of these, however, could be given in a single dose, and, until this could be done, oral therapy would remain unpractical

The group recognized that 2 ml of penicillin would render a large proportion of yaws patients non-infectious, but felt that a somewhat larger total dosage was preferable The consensus of opinion was that 1,200 000 to 1,800,000 units was a suitable dose for adults, and that children should receive proportionately smaller amounts To facilitate the campaign the treatment was best given as a single injection of PAM

Yaws contacts may be defined as the population subject to the danger of contracting yaws Family contacts, especially children in the family, are considered to be the group subject to the greatest risk All children under the age of 15 are subject to risk, but to a lesser degree than those in the immediate family of infectious yaws cases It was considered that the degree of risk to the contacts was in direct proportion to the prevalence of infectious yaws cases A study carried out in Indonesia indicated that the contacts of infectious yaws cases constituted one third of the total number of new cases found on resurveys Another third of the new cases were from the much larger population group which was not exposed to family risk There was no unanimity of opinion regarding the advisability of treating contacts during a mass campaign against yaws However, the data presented to the Symposium suggested that there was value in the procedure For instance, the data contained in table I, which have been supplied by Dr Kodijat from information concerning the yaws control programme in Indonesia, suggest that, as more members of a household are treated simultaneously, the prevalence of new cases found at resurveys will decrease they thus support the view that household contacts should be treated

TABLE I. DATA ILLUSTRATING THE IMPORTANCE OF TREATING HOUSEHOLD CONTACTS

TABLEAU I. DONNÉES MONTRANT L'IMPORTANCE DU TRAITEMENT DES CONTACTS DOMESTIQUES

Number of cases per household at nitial exam nation *Nombre de cas par ménage au premier examen*	Number of households *Nombre de ménages*	Number of persons in all households *Nombre de personnes dans l'ensemble des ménages*	At initial exam nat on *Au premier examen*		At resurvey *A l'examen de contrôle*			
			total yaws cases *Nombre total de pianiques*	number of infectious yaws cases *Nombre de pianiques infectieux*	total new yaws cases *Nouveaux cas de pian*		new infectious yaws cases *Nouveaux cas de pian infectieux*	
					number *Nombre total*	percentage of all persons *Pourcentage du nombre total de personnes*	number *Nombre*	percentage of all persons *Pourcentage du nombre total de personnes*
1	233	990	233	112	117	11 8	49	5 0
2	153	804	306	126	86	10 7	27	3 3
3	57	315	171	72	18	5 7	7	2 2
4	24	147	96	49	7	4 7	4	2 7
5	13	91	65	28	8	8 8	3	3 3
6	5	41	30	19	2	4 9	0	0
7	1	9	7	4	0	0	0	0

DISCUSSION : PARTIE VI

Président Dr M A VAUCEL
Rapporteur Dr F W REYNOLDS

Au cours d'une campagne systematique contre le pian, il n'est pas possible pour le médecin de travailler dans des conditions idéales En effet, on doit s'accommoder de personnel non specialise, les epreuves serologiques courantes ne peuvent être effectuees sur tous les sujets, et, dans le choix de la dose curative, un certain compromis doit être trouve entre la dose optimum et le coût du medicament Il est important de traiter en peu de temps une zone aussi etendue que possible, afin d'eviter le plus possible une infection de la region par la péripherie

Les participants au Symposium relevèrent d'un commun accord que plusieurs médicaments, administrés par voie buccale, etaient actifs contre le pian Aucun de ceux-ci cependant ne peut être administre en dose unique, tant qu'il en sera ainsi, la therapie par voie buccale restera illusoire

De l'avis du groupe, 2 ml de penicilline pourraient rendre non infectieux une forte proportion des malades, mais une quantite totale plus elevee est à preferer L'opinion generale fut en faveur de 1 200 000 a 1 800 000 unités pour les adultes, la dose pour enfants etant réduite proportionnellement Pour faciliter la campagne, la pénicilline sera administree sous forme d'une injection unique de PAM

On designe sous le nom de « contacts » les habitants susceptibles de contracter le pian Les contacts familiaux, plus specialement les enfants, sont consideres comme courant les plus grands risques Tous les enfants de moins de 15 ans risquent d'etre infectés, mais les plus gravement exposes sont ceux qui vivent dans l'entourage familial de sujets infectieux On estime que le risque d'infection de contacts est directement proportionnel au nombre des cas infectieux existant Une enquête en Indonesie a montre que les contacts vivant dans l'entourage de sujets infectieux constituaient un tiers du nombre total des cas nouveaux observés au cours d'enquetes de contrôle Un autre tiers provenait de groupes de population beaucoup plus nombreux, qui n'etaient pas exposes aux risques d'infection familiale La question de l'opportunite de traiter les contacts au cours d'une campagne antipianique a eté debattue sans qu'une solution ait pu rallier l'unanimite Cependant les opinions exprimées au cours du Symposium indiquent que cette mesure peut avoir de l'importance C'est ainsi que les chiffres reunis dans le tableau I, etablis par le Dr Kodijat d'après les experiences faites en Indonesie, montrent que plus sont nombreux les membres d'une maisonnee traités au même moment, plus sera faible le nombre de nouveaux cas trouves a l'enquête de contrôle Ces chiffres parlent donc en faveur du traitement des contacts

Part VII

CONSOLIDATION PHASE

Partie VII

PHASE DE CONSOLIDATION

CONSOLIDATION PHASE OF YAWS CONTROL

Experiences in Africa

C. J. HACKETT, M D, F R C P

Director, The Wellcome Museum of Medical Science, London

Reynolds, Guthe & Samame [15] very usefully define the consolidation phase of a yaws-control programme as that in which the anti-yaws measures are integrated with the permanent public-health structure of a country so that no other important public-health activity is overshadowed Yet the immediately preceding anti yaws measures must be maintained to prevent the few infectious relapses that may occur, during subsequent years, from re-infecting the non-immune section of the population, which naturally increases each year Such a reappearance of yaws was observed by Lambert [11] in Western Samoa four years after intensive treatment had practically eradicated infectious yaws

Since there are few published reports of anti yaws campaigns in Africa, and still fewer of adequate trials of antibiotics in this field, it was felt that, in view of the impracticability of visiting all the African endemic areas of yaws, the information required for the preparation of this paper could best be obtained by the circulation of a questionnaire (see Annex 1, page 339) This questionnaire was translated into French, Portuguese, and Spanish and accompanied a questionnaire relating to the extent and nature of the yaws problem in Africa [a] and a covering letter which explained their purpose It was distributed throughout Africa in August and September 1951, and the countries from which replies and other data were obtained are practically the same as those listed in Annex 2 of the earlier paper

Apart from the activities of the Fonds Reine Elisabeth pour l'Assistance médicale aux Indigènes (FOREAMI) there is only one adequately planned and conducted anti-yaws campaign in Africa that has been extensively reported in the medical press—that referred to by Apted et al ,[2] Harding,[8] and Apted [1] This is, moreover, the only campaign reported to have passed into a consolidation phase

In the absence of much data relevant to this phase, some useful purpose may be served by considering the information (variable in value though it may be) on anti yaws activities that has been received in the replies to the

[a] See paper by Hackett on page 129

questionnaire referred to above The material available will be dealt with throughout this paper under the various headings of Annex 1 in alphabetical order of countries

Past and Present Anti Yaws Campaigns

From the replies to the questionnaire it was evident that the term anti yaws campaign was subject to wide interpretation The expression must be defined For the present purpose an anti yaws campaign will be regarded as a series of events in which some specific activity is directed against the disease, in addition to the general activity of the established medical service Some effort should be made to bring treatment or other preventive measures to the patients or the patients to treatment in addition to the establishment of static general treatment centres, which may be regarded as the normal development of the medical services

Ideally a campaign should consist of a survey, treatment of all infectious and latent secondary cases, and later recognition and treatment of infectious relapses in treated patients and in patients in the latent secondary stage at the time of the survey The population should be surveyed at regular periods afterwards, for only by this means can an accurate assessment of the results and, thus, of the efficacy of the measures taken, be obtained

Anglo Egyptian Sudan

No past or present campaigns

Belgian Congo

In Mayumbe since 1933 yaws has been diagnosed and all cases treated during the course of the antitrypanosomiasis campaign A census of the population was taken and kept up to date each year Trypanosomiasis is 'totally defeated" [b] and yaws is greatly reduced The treatment usually given is bismuth subgallate 10% oily suspension, 3 ml weekly for ten injections combined with six to ten injections of 0 3 0 9 g of neoarsphenamine However, often only three injections of neoarsphenamine and ten of bismuth

penicillin G ir

small scale

bismuth therapy, hepatitis infrequently followed neoarsphenamine and more often arsenoxide Treatment is free, the Government finances the campaign About 10% of a population of 200 000 are treated annually No general serological control is undertaken

[b] All quotations for which no specific reference is given are taken from the replies to the questionnaire sent out by the author — Ed

The population is surveyed annually and during the year treatment is available at rural dispensaries Other endemic diseases such as, of course, trypanosomiasis, and tuberculosis, leprosy, and syphilis are sought at the surveys

The results of the campaign by FOREAMI in the Bas Congo, which lasted from 1931 to 1935 (see table I), are given by Mouchet [13] and are from a 1934 population of 774,599

TABLE I INCIDENCE OF YAWS AND SYPHILIS IN THE BAS CONGO 1931-5 CAMPAIGN

Year	Incidence of yaws	Incidence of syphilis
1931	23 647	—
1932	13 926	430
1933	12 914	518
1934	8 090	236
1935	5 631	188

The 1935 figures are incomplete because part of the area had already been handed over to the Government However, the reduction of yaws incidence is due to the efficiency of the FOREAMI work, the purpose and *planning of which is discussed by Mouchet [13] The more recent FOREAMI* work in the Kwango area has not been so spectacular, although the yaws incidence had dropped from 1,604 in 1938 to 630 in 1949

Gambia

No past or present campaigns

Gold Coast

From 1944-6 an experimental campaign was carried out in the Dagomba district of the Northern Territories with headquarters at Yendi A complete survey of all inhabitants, village by village, was made All types of yaws patients were treated The main drugs used were bismuth sodium tartrate, Bisglucol (0 2 g of metallic bismuth per ml), and acetylarsan (diethylamine acetarsol, 0 236 g per ml), in weekly injections The usual course was six injections of bismuth, if lesions were not then healed, four to six injections of acetylarsan were given but the drugs were not given together A 12 week session was held in which bismuth was given for the first 6-8 weeks and acetylarsan for the last 6-4 weeks The doses used for adults were Bisglucol 1-2 ml, bismuth sodium tartrate 2 0-2 5 ml (0 13 0 16 g), and acetylarsan 2 5 ml The first named preparation was non toxic, stomatitis occurred in

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[b] All quotations for which no specific reference is given are taken from the replies to the questionnaire sent out by the author — Ed

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Gambia

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5% of patients treated with the second, and transient headache and diarrhoea on the same day sometimes followed the last Treatment was free The incidence of yaws is shown in table II.

TABLE II YAWS CASES IN EASTERN DAGOMBA, GOLD COAST (1944 6 CAMPAIGN)

Year	Population examined	Number of cases found	Percentage of population infected	Number of cases treated *
1944	22 683	4 323	19 06	6 006
1945	51 336	13 620	26 53	17 146
1946	141 888	16 407	11 56	20 609

* The number of cases treated exceeds that of cases found because patients from outside the area sought treatment

No serological investigations were made, but in 1944 it was recorded that, of the 6,006 patients treated, 7% were not clinically cured at the end of treatment, of these " the majority were quite incurable ". A later series of 6,984 treated with combined bismuth and acetylarsan had an apparent clinical-cure rate of 93% 6 months later

Resurvey findings in this area are given in table III No record was made of new patients with primary or secondary lesions, all cases found were called relapses As patients' names were not recorded it was not possible to follow them up on later occasions

TABLE III RESURVEY FINDINGS AFTER 1944-6 CAMPAIGN IN EASTERN DAGOMBA, GOLD COAST

Year	Number of cases found originally		Number of relapses		Relapse rate (%)	
	primary and secondary	tertiary	secondary	tertiary	secondary	tertiary
		6 months after initial treatment				
1945	3 782	4 152	270	648	7 14	15 61
1946	5 963	6 964	284	503	4 76	7 22
1947	2 845	2 614	272	329	9 56	12 59
		18 months after initial treatment				
—	2 644	2 777	186	265	7 03	9 54
		34 months after initial treatment				
—	1 116	1 265	123	188	11 0?	14 86

Since no supervision or treatment was carried out apart from the resurveys, when presumably cases found were treated, it is probable that many

TABLE V RESULTS OF 1935 AND 1937 CAMPAIGNS IN MOGAMO TRIBE, BAMENDA, BRITISH CAMEROONS

Year	Number of population examined	Pr mary yaws		Secondary yaws		Tert ary yaws		Palmar and plantar lesions		Total number of cases		Incidence (%)
		adults	children	adults	children	adults	children	adults	children	adults	children	
1935	8 743	4	47	10	513	110	31	302	0	426	591	11 6
1937	8 500	4	37	14	258	94	9	159	1	271	305	6 8

the first area approximately 15,000, and in the second 6,246, patients were treated but no follow-up was possible In Embu District after the campaign a District Dispensary Service was established In both areas the anti yaws activities were associated with general medical welfare and anthelmintic treatment

Mozambique

No past or present anti-yaws campaigns

Nigeria

There are no past or present anti yaws campaigns except that reported by Simpson [17] who in 1935 carried out mass treatment for yaws in the Bamenda Division of the British Cameroons Its purpose was the reduction f infectious lesions To each village a yaws attendant, selected by the llage chief, was sent after a month's training The attendant was generally nember of the chief's family and thus had some authority The attendants orted to the central district hospital once each month Treatment was ..ce and consisted of intramuscular injections of sodium bismuth tartrate (Sobita) 0 18 0 24 g (3-4 grains) for an adult at 5 to 10-day intervals for five to six injections Arsenical preparations were not often used on account of expense Stomatitis sometimes occurred Table V gives Simpson's figures

In January 1952 surveys were being made in a number of areas in Nigeria by medical field units In 1950-1 at Wum in Bamenda, a yaws incidence of 20% 25% was found, Simpson [17] gave 16 5% as the incidence in 1937 The measures he had introduced had ceased for some time and in recent years treatment facilities have been meagre

Nyasaland

Efforts were made in two areas, Karonga, Northern Province (1931) and Dedza, Central Province (1924), to treat all yaws patients who sought treatment They were given bismuth 0.2 g twice weekly to a total of eight injections No toxic manifestations were recorded Treatment was free In the first area, treatment continued to be available at the local dispensary, but in the second no medical facilities were offered after the period of treatment No surveys or serological studies were made The hospital attendances for yaws are shown in table VI

Dr W H Watson, who was in charge of the work at Karonga, reports that in 1930 he was disturbed by the fact that, although the Africans recognized primary and secondary yaws, they deliberately delayed treatment until the florid secondary stage appeared, the average number of injections received was three Most of the cases had tertiary lesions, which the treatment received was not effective in preventing, secondary relapses were

TABLE VI HOSPITAL ATTENDANCES IN NYASALAND BEFORE 1931 CAMPAIGN AND IN 1950

Area	1931			1950		
	all patients at district hospital	yaws patients for whole district	yaws (%)	all patients at district hospital	yaws patients for whole district	yaws (%)
Karonga (Northern Province)	11 177	1 523	13 6	16 476	1 056	6 4
Dedza (Central Province)	—	578	—	—	70	—

observed after treatment To counter this a register of patients was kept and the necessity of full treatment was explained to the chiefs and the general population Of one series of 223 patients treated at the hospital in 1931, 181 received eight injections, 54 had received previous treatment Tertiary cases were the most frequent, as is shown by the following incidence among the 223 primary lesions, 6, secondary, 32, tertiary, 185 It is probable that the decreased incidence of yaws in 1950 was due more to continued treatment received at the local dispensary than to any efforts in 1931

In the lake shore area of Dedza District a more active attempt to deal with yaws was made There were two Government dispensaries and two Catholic Missions in an area of about 300 square miles (775 km²) In 1924 two trained Africans under the supervision of the Mission at Ntakataka but financed by the Government, travelled the area on bicycles seeking primary and secondary yaws patients and sending them to established centres for treatment ' The diagnosis of tertiary yaws was beyond them By 1934 yaws had decreased to such an extent that these two Africans were withdrawn The only figures available are those given in table VI Dr Watson says " the moral seems to be that concentrating on primary and secondary yaws and seeking out the patients in the villages is an effective method of reducing the incidence of yaws to negligible proportions

Portuguese Guinea

No specific anti yaws campaigns have been conducted or were in progress at the time of the questionnaire

Sierra Leone

Present campaigns are preceded by a survey during which medical attendants visit villages and examine the population All yaws cases are treated Acetylarsan 2 ml and bismuth salicylate suspension (0 09 g per ml)

TABLE VII CLINICAL AN… …OLOGICAL RESULTS AFTER TREATMENT OF YAWS IN EA… …RRA LEONE (1945-8 CAMPAIGN)

Period after treatment (years)	Therapeutic course *	Lesions originally present	Number of cases	Clinical findings (%)				Kahn results (%)				
				active yaws	inactive plantar lesions	slight plantar irregularities	no lesions	3+ to 4+	1+ to 2+	weak +	±	−
½	A 3 × 2 ml + B 4 × 0.25 g	infectious	27	0	8	22	70	26	22	19	11	22 } 27
		non infectious **	33	3	6	33	58	9	21	6	33	30
1	A 4 × 4 ml + B 4 × 0.19 g	infectious	75	1	3	32	64	—	—	—	—	—
		non infectious	108	5	10	51	34	—	—	—	—	
1½	A 4 × 4 ml + B 4 × 0.19 g	infectious	29	—	—	—	—	3	38	10	17	31 } 38
		non infectious	42	—	—	—	—	5	24	10	19	43
2	A 4 × 5 ml + B 4 × 0.25 g	infectious	90	1	[illegible]	21	76	—	—	—	—	—
		non infectious	154	2	1	43	45	—	—	—	—	
2½	A 4 × 5 ml + B 4 × 0.25 g	infectious	35	—	—	—	—	6	23	20	14	37 } 31
		non infectious	51	—	—	—	—	6	25	20	22	27
All periods infectious and non infectious (a) clinical findings			487	2.3	7.4	36.8	53.6	—	—	—	—	—
(b) Kahn results			217	—	—	—	—	8.3	25.3	14.3	19.8	32.3

* A = acetylarsan B = bismuth sodium potassium tartrate
** Non infectious lesions included tertiary lesions and dry secondary lesions

in arachis oil 2 ml are used No toxic manifestations are recorded About £10,000 ($28,000) per annum are spent by the Government on antitrypanosomiasis and anti-yaws campaigns About 65,000 people are examined and 29,700 treated for yaws each year Additional treatment centres are being established in the area and surveys and treatment will be repeated at one- and two-year periods Harding[8] says that the anti-yaws campaign in the eastern areas which began in 1942 arose out of the pre existing antitrypanosomiasis campaign and became part of the same organization The yaws incidence, on clinical observation, was between 10% and 15% of the population Surveys preceded mass treatment

Apted et al [2] report the clinical and serological results of treatment in eastern Sierra Leone of secondary yaws with acetylarsan (diethylamine acetarsol) and bismuth sodium potassium tartrate (BSPT) The latter appeared relatively ineffective, this was accounted for later (Harding[8]) when it was found that its bismuth content was of the order of 4 5% instead of the usual 60% The interval between injections was 5 7 days Table VII summarizes the findings of Apted and his colleagues They conclude that acetylarsan in the doses used probably cured about a third of the patients and rendered the disease quiescent in most of the others for an indefinite though prolonged period They stress the importance, in assessing clinical relapse rate, of frequently repeated observations (three to four times a year) over long periods, otherwise relapses may occur and heal spontaneously and thus be missed

Harding[8] states that if repeated doses of 3 ml or more of acetylarsan were used, toxic manifestations occurred Finally, the standard dosage was four injections each of acetylarsan 2 5 ml and bismuth salicylate 0 25 g, given concurrently He summarizes the data in Apted et al [2] (given in table VII) and points out that the spontaneous decrease of secondary yaws during the dry season makes assessment by clinical observation uncertain, and that serological findings are often of more value In addition, he discusses the results following three types of campaign (see table VIII)

Six months after the last result of the third campaign shown in table VIII, all anti yaws activity ceased Seven months after this a sample of 1,670 people was surveyed and it was found that the incidence of infectious yaws had already risen to 1 7% Harding calls attention to the results of Apted et al [2] shown in table VII, and points out that since, after treatment, it was found that the infection in most patients remained quiescent for an " indefinite though prolonged period ", these new cases were almost certainly due to the relapse of infections which were in the latent secondary stage at the time of mass treatment or survey This further emphasizes the essential part played by the itinerant attendant, who visits the villages served by his treatment centre, in seeking patients with infectious lesions who, from either laziness or pressure of work, do not attend of their own accord

TABLE VIII PERCENTAGE INCIDENCE OF INFECTIOUS YAWS IN SIERRA LEONE, 1942-6 CAMPAIGN

Type of campa gn	Years after first act v ty				
	0	1	2	3	4
Period c mass treatment alone	13 7 % W	5 8 % D	—	7 5 % W	—
Pe od c mass t eatment w th prov s on of permanent treat ment fac l t es	5 8 % D	—	3 0 % D	1 8 % W	0 9 % W
Mass treatment followed by d s pensary fac l t es comb ned w th home v s ts	3 4 % W	0 6 % W	0 0 % W *	—	—

* A year and a half after f rst activ ty
W = wet season
D = dry season

In addition to yaws and trypanosomiasis the other important endemic diseases were treated at the established treatment centres During one year 40,250 cases were dealt with at seven general dispensaries and seven dispen-aries for the treatment of the more frequent diseases Among the more ommon causes of attendance are

Disease	*Number of cases trea ed (1946)*
Yaws	10 400
Trypanosomiasis	1 530
Bilharziasis	700
Ankylostomiasis	580
Ascariasis	1 760
Amoebiasis (intestinal)	660

 two places where chiefs and people were favourably disposed mater entres were built and suitable girls were trained as midwives A n doctor and sisters of the nearby Segbwema Methodist Mission al were of great assistance The nuclei of two new chiefdom head s villages were planned, and their construction supervised to replace ges of dirty, crowded huddles of huts Water supplies were improved and, with the co operation of the Agricultural Department, fruit trees were planted round the dispensaries as an object lesson

Harding estimates that with one survey team and two treatment teams, 120 000 persons a year could be handled provided the population density were in the region of 50-100 per square mile (20 40 per km²) He points out that few infectious lesions develop in patients over 30 years of age

The European staff consisted of three medical officers for the first half year and two for the second but one of these was almost fully occupied with a special trypanosomiasis investigation

The cost, including salaries, equipment, buildings, transport, etc, but excluding drugs and dressings for diseases other than yaws and trypanosomiasis, was under £10,000 ($28,000)

Harding stresses that these activities would not have been possible without the confidence which successful treatment of trypanosomiasis and yaws had created, and the close contact between the population and staff which resulted from the mobile character of the campaign

Since resources were limited, it was decided that rather than treat gonorrhoea inadequately or attempt an epidemiological study of bilharziasis (which, although in one area it affected 75% of the population, lack of staff made it impossible to investigate in a reasonably short time) it

"seemed better to concentrate available resources on those improvements in general sanitation and midwifery which were possible in the immediate vicinity of the dispensaries together with the treatment there of those endemic diseases readily diagnosable and curable by attendants trained for the purpose and proficient in the use of the microscope and syringe" [c]

Apted[1] reports the results of examining 406 yaws patients exactly two years after they received five injections, at intervals of 5-7 days, of bismuth salicylate suspended in arachis oil 2 ml (0 25 g of bismuth salicylate) for an adult weighing 120 pounds (54 kg) Of these 406 patients, 17% had active (probably secondary) lesions, 31% had inactive painless plantar lesions 27% had slight plantar irregularities, and 25% had no lesions The serological results in 236 of these 406 patients gave the following percentages of the above four groups Kahn ± or Kahn — in 0, 17, 28, and 36 respectively 42% of all four groups gave Kahn reactions of 4+ to 3+, and 37% gave 2+ to 1+ Thus less than a quarter of the patients investigated had been cured This is inferior (table VII) to the results following acetylarsan with or without bismuth (Apted et al[2]) However, Apted[1] thinks that, in Sierra Leone, mass treatment with bismuth salicylate of the vast numbers of patients with non infectious plantar lesions is adequate since further treatment when required is available at the numerous permanent treatment centres Since the above study, the dose has been increased to 2 ml for a patient weighing 100 pounds (45 kg)

Southern Rhodesia, Spanish Guinea, Tanganyika

No special campaigns

Uganda

In 1949 50 an anti yaws campaign was carried out in Lango District A satisfactory preliminary survey was not made All patients either with

[c] Information on these additional activities has been taken from a typescript insertion which the late Dr R D Harding made in the reprints of his 1949[a] paper

open secondary yaws or considered likely to relapse, were treated, together with patients with chronic ulcers and palmar and plantar yaws Primary or secondary lesions were found in 85% of those treated, the whole population was apparently scrutinized

For open lesions, arsenical preparations—sulfarsphenamine for children and oxyphenarsine tartrate (0 09 mg) for adults—plus bismuth oxide 2 ml (0 2 g) for adults were used An arsenical and a bismuth preparation were given on the first two days of treatment, after which bismuth alone was given to a total of four to six weekly injections In the absence of open lesions, bismuth oxide 2 ml alone was given for a similar course

At the end of August 1949, 420 cases of stomatitis were reported in an area treated by all three injection teams between 27 June and 6 August, 52 patients were seriously ill and 13 died, only 22 admitted having had injections, and none admitted to more than two Analysis of the bismuth preparation showed that it was of correct composition, but the sample examined may not have been of the same batch as that used throughout Technique of administration appeared to have been quite satisfactory Traces of bismuth were found in the liver but there was no histological vidence of toxic action The cause of these deaths was not certain Similar ıultiple deaths had occurred during routine anti yaws measures in Kigezi 936) and Gulu (1940) when a number of persons died suddenly In the st occurrence it seemed that failure to sterilize materials, when unauthor- d injections were being given, may have been the cause

The Lango campaign cost £7,776 (about $21,775) and 25,585 patients e treated out of a total population in the area of about 268 600 The per patient was 73 pence ($0 85), the analysis of which is given in : IX

TABLE IX ANALYSIS OF THE COST PER PATIENT IN THE 1949-50 LANGO CAMPAIGN UGANDA

Budget d v s on	Cost per pat ent		Pe centage of cost per pat ent
	pence	dollars	
Salaries			
1 European med cal off cer	15	0 18	21
13 Afncan ass stants	11	0 13	15
Travelling expenses			
1 European med cal off cer	8	0 09	11
19 Af can assistants	6	0 07	8
Drugs	27	0 31	37
Equipment and sundries	6	0 07	8
Total	73	0 85	100

About 60% of the cost of the drugs was spent on arsenical preparations, and about 25% on the bismuth oxide, which was prepared in Uganda The cost was shared equally by the central Uganda Government and the local Lango native administration Treatment was free Table X gives data on the patients treated

TABLE X DISTRIBUTION BY AGE AND STAGE OF YAWS OF PATIENTS TREATED IN 1949-50 LANGO CAMPAIGN, UGANDA

Age (years)	Population at risk *	Number of patients treated **	Percentage of population treated	Number of yaws patients			
				primary	secondary	tertiary	total
0 5	63 800	4 053	6 35	177	3 315	218	3 710
6 15	60 000	6 212	10 35	68	4 553	951	5 572
15 20	30 000	3 552	11 84	9	1 638	1 426	3 073
21 and over	114 800	11 768	10 25	25	2 331	7 739	10 095
Total	268 600	25 585	9 53	279	11 837	10 334	22 450
Percentage of yaws cases				1 24	52 73	46 03	100
Percentage of population treated for yaws				0 10	4 41	3 85	8 36

* The whole population was scrutinized
** These included cases of syphilis chronic ulcers etc

No serological observations were made Observations on 50 patients with secondary yaws treated with bismuth oxide indicated that little improvement was noted unless the eruption had been present for more than 6 weeks and was beginning to dry After the administration of arsenical preparations, all florid yaws were healed within 4 weeks Wet plantar and palmar lesions were improved, but dry scaling lesions were unaffected by treatment

It will be seen in table X that 8 36% of the population were treated for yaws during the survey, however, 17 5% of all outpatient attendances were diagnosed as yaws during 1940-9 No serological studies were made In one area (Bala) a survey made 9 months after the campaign showed that infectious cases had been reduced by 95%, a second survey 10 months later showed that the incidence of infectious cases had risen considerably Further reports indicate that the campaign temporarily reduced the incidence of early yaws in children, but in October 1951 the number of secondary cases was rapidly rising It is thought that not all infectious cases were brought for treatment (Relapsing latent secondary cases were probably also important)

Results of surveys are given in table XI

seven arsenical and four bismuth injections The following results were observed 39 patients (15 2%) relapsed in 1-7 months, 111 patients (43 4%) had not relapsed in 5-12 months when they left the mine, 106 patients (41 4%) had not relapsed in 15 24 months and were still working in the mine Serum from 63 patients who left the mine 1-10 months after treatment was Wassermann-positive in 19 (30 2%) and negative or doubtful in 44 (69 8%)

In the outbreak in Springs Mines in 1942, Dr H H Wright[d] reports that the treatment given was six weekly injections of neoarsphenamine (0 45, 0 6, 0 6, 0 75, 0 75, 0 9 g) and Bisglucol 1 ml (0 2 g of metallic bismuth) Only one clinical relapse was observed up to 5 months after treatment The serum from all patients was Wassermann positive when treatment was started, 3 months later that from 26 out of 28 patients was negative, and 6 months after treatment that from 10 out of 12 was negative and one of those with a positive reaction was found to have contracted syphilis after earlier serological cure of yaws

The Effect of Anti-Yaws Treatment at Established General Medical Clinics

Anglo Egyptian Sudan

All patients seeking treatment are treated free, the Sudan Government bears all costs Adults are given three injections of neoarsphenamine 0 45 g and four injections of Bisoxyl 2 ml (bismuth oxychloride 0 1 g per ml) during a period of 16 days, children are given one injection of penicillin 0 3 mega units and two of acetylarsan 2 ml No toxic manifestations are seen In the southern area where yaws is endemic (Upper Nile, Equatoria, Bahr el Ghazal) there are 2 1 million people, of these 29,794 were treated for yaws in 1948, 28,778 in 1949, and 31,714 in 1950 In the Upper Nile district yaws accounted for 3 8% of outpatient attendances in 1945 and for 2 7% in 1950 Dispensary services are being further improved and tours are being made more often by supervisory staff and by the hospital ship, "Lady Baker" in most highly infected areas In general, yaws incidence is rapidly decreasing

Belgian Congo

Van Nitsen [14] discusses the treatment of yaws with a number of arsenical and bismuth preparations and although in some cases serological reversal occurs at the time of clinical cure ("blanchiment"), usually 2-3 times the dosage required for a clinical cure is needed for a serological one None of the cases studied serologically was followed for more than 6 months and

[d] See also paper by Hackett on page 129

be preferred to trivalent arsenicals which are less expensive, less toxic, more active but require to be injected subcutaneously or intravenously Whilst continuing to use the stovarsol still in stock neoarsphenamine replaced stovarsol from 1934 and treatment was given on fixed days "

Gambia

Since January 1951, treatment has been free Arsenical and bismuth preparations are used Patients almost invariably cease attending for treatment as soon as the outstanding manifestations start to disappear

French West Africa

The treatment of choice is with bismuth salicylate and Soluquinby (iodobismuthate of quinine containing 0 01 g of bismuth per ml)

Gold Coast

In some centres (Kumasi) where treatment has been available, and charged for, the incidence of yaws appears to have greatly decreased, but factors other than the presence of facilities may have played a part—for example, Sanitary Superintendents at one time ordered all patients with obvious yaws to have treatment Whether fees are charged or not does not appear to influence regularity of attendance Registration of patients' *names at the chief's office increased regularity in Lawra*

Colbourne et al [4] studied a population of 255 in the village of Kwan sakrom which is 3 miles (5 km) from a large African town and 60 miles (96 km) from Accra It is situated on the southern edge of the central rain forest and in a cocoa-growing area A history of yaws was given by 195 (76%), and evidence of yaws was found in 95 (37%) Of the 195, treatment at the Government clinic, 3 miles (5 km) away, had been received by 66 (34%), clinical yaws was prese[illegible] positive in 64 (33%) Of the [illegible] gave positive Kahn reactions [illegible] " the only value of the treatment may have been to render a few cases non infective, perhaps only temporarily " *However, they do state* that " in most cases the clinical signs of yaws were mild ". Only 3 severe tertiary *lesions and 2 primary lesions were seen, which is perhaps* what might be expected in an untreated community of the same size

Kenya

Treatment consists of metallic bismuth suspended in glucose solution The dose is 0 2 g at weekly intervals *for as long as the patient reports* for treatment Penicillin has been found to be increasingly useful It is said that in some areas where florid yaws was once prevalent, outpatient-clinic treatment has made such lesions very infrequent

Mozambique

All yaws patients who seek treatment or are recognized during inspections, as in antitrypanosomiasis campaigns, are treated free The usual drugs are bismuth in oily suspension (0 125 g of metallic bismuth per injection) and neoarsphenamine, both given twice weekly The amount given depends upon the frequency of the patients' visits and the days they attend, since neoarsphenamine is given only under medical supervision and a doctor is present only on certain days Bismuth 1 5 g and neoarsphenamine 3-5 g clear up all primary and secondary lesions, but tertiary lesions require more treatment Recently penicillin has proved very effective, it is cheap and easily administered, and its effects impress the patients Toxic reactions are very rare, bismuth stomatitis has occasionally been seen A number of treatment centres in addition to Government clinics have recently been set up Clinical results of treatment of the patients in the primary and secondary stages are good, the response in the tertiary stage is less satisfactory, for patients do not continue attending for adequate treatment, and gangosa is nearly always fatal

No surveys have been made The numbers of yaws patients treated were as follows 44,757 in 1945, 54,925 in 1946, 59 364 in 1947, 61,286 in 1948, 65,099 in 1949, and 62,791 in 1950 The rise is probably due to increased treatment facilities

Nigeria

In many areas the demand for anti-yaws treatment has been large and has resulted in an amazing decrease in yaws, noticeable even on rapid inspection Bismuth is still the substance most used, but arsenical preparations are administered under medical supervision

Nyasaland

All treatment in Government establishments is free The usual treatment is neoarsphenamine in three doses of 0 45, 0 6, and 0 6 g at weekly intervals The numbers treated in the past 10 years are given in table XII

Portuguese Guinea

The static treatment and the mobile prophylactic units in the Antitrypanosomiasis Service also treat, free of charge, patients with primary and secondary yaws found during trypanosomiasis surveys Other medical establishments provide free treatment only for those patients who seek it Treatment may consist of (a) six to twelve injections of bismuth, (b) three injections of neoarsphenamine, (c) one to two injections of neoarsphenamine and six of bismuth, or (d) acetarsol (Stovarsol) 0 5-0 75 g daily to a total of 12-

15 g for adults Friedheim's STB is on trial Other endemic diseases are treated at the same time Toxic manifestations are rare, and from the clinical point of view the results appear satisfactory, but no surveys have been undertaken

TABLE XII NUMBER OF YAWS CASES TREATED ANNUALLY IN NYASALAND 1941 50

Year	Number of cases treated	Year	Number of cases treated
1941	2 514	1946	—*
1942	2 905	1947	2 986
1943	3 691	1948	1 796
1944	4 349	1949	3 122
1945	4 552	1950	2 778

* Unknown

Sierra Leone

Near clinics, results are good but the effect on infectious cases is probably temporary

Southern Rhodesia

Treatment is free for those seeking it In the isolated Zambesi area, a medical patrol is made each year

Spanish Guinea

All types of yaws patients are treated free The usual course is one injection of neoarsphenamine and two of bismuth each week for 8-10 weeks Toxic manifestations are rare Attendance is good and since a card index is kept in each health zone some control can be exercised Patients attend for treatment with the early lesions, thus tertiary lesions are rare

The results of treatment after a few years are seen by a decrease in patients and a reduced frequency of advanced lesions, particularly bony deformities

Tanganyika

All yaws cases seen are treated free Bismuth salicylate is replacing bismuth sodium tartrate Adult treatment consists of neoarsphenamine 0 45 g and bismuth 0 1 g weekly for five to six injections Severe toxic manifestations are now rare, although deaths occur from time to time from

verdosage resulting from carelessness in measuring the dose Stomatitis occurs fairly frequently The numbers of cases treated in the past 30 years are shown in table XIII

TABLE XIII NUMBER OF YAWS CASES TREATED ANNUALLY IN TANGANYIKA, 1921 50

Year	Number of cases treated	Year	Number of cases treated	Year	Number of cases treated
1921	1 109	1931	112 128	1941	77 999
1922	3 122	1932	114 115	1942	72 563
1923	3 616	1933	109 113	1943	79 232
1924	20 716	1934	117 884	1944	71 891
1925	75 689	1935	104 611	1945	69 090
1925	97 809	1936	101 179	1946	51 259
1927	120 374	1937	110 819	1947	60 766
1928	127 439	1938	132 469	1948	61 948
1929	126 419	1939	75 081	949	61 8 3
1930	137 112	1940	75 069	950	2 374

From 1924-30, great progress was made in the establishment of rural medical facilities The incidence of florid yaws has decreased remarkably, this was noticed as early as 1927 in areas where treatment was available At present, in and around urban and highly populated areas with good communications, it is late bone complications which are chiefly seen, and these are not readily distinguished from syphilitic lesions

Uganda

Since 1939 all treatment has been free Bismuth and arsenical preparations have been used, recently oxyphenarsine has been replacing neoarsphenamine for the treatment of adults Doses are usually given weekly ut 2 3 is the average number received Although such treatment temporarily relieves the sufferer, " there has been no apparent effect on the incidence in the community " At the Lira clinic in Lango District, the average annual attendance for yaws from 1928 36 was 20 9% of 14,700 attendances for all causes (Hackett [9]), during the period 1940-9, this average was 17 5 (More knowledge of subsidiary factors, such as the relative incidence of secondary lesions, and the areas from which the patients come—since the opening of a dispensary might attract yaws patients from the District Hospital—would be required before this reduction could be attributed to the introduction of free treatment in 1939)

Recommendations, Based Upon Experience, for Conducting Anti Yaws Campaigns

Belgian Congo

The purpose of the campaign should be the reduction of the disease to a very low endemic level, *ultimately its eradication seems possible*

Anti yaws campaigns should be preceded by a census followed by medical inspection and treatment of yaws patients Rural dispensaries should be established to ensure continuity of treatment Surveys and *re treatment of active cases should be carried out every 6 months and later*, every 12 months A team of one European medical auxiliary, one African secretary, and three African hospital attendants can examine 500 patients a day and treat 200-250

*The ideal drug for anti yaws campaigns should rapidly sterilize infec*tious lesions, should be of low toxicity, should be easy to administer in the field and especially to children, and if possible should rapidly cause serological reversal Penicillin—100,000 units per kg—and STB (Stovarsol trivalent—*B A L* of Friedheim)—20 mg per kg in a 5 day course—appear closely to approach the ideal PAM alone may prove to be nearest to the ideal preparation Serological examinations may be made at the time of survey

The co operation of chiefs must be sought and the community must be educated to seek treatment The intention is to prevent the appearance of infectious lesions Van Nitsen [14] indicates that anti yaws measures should be part of a more extensive preventive campaign The initial survey should be made by mobile teams, and some treatment carried out in medical camps, but severely ill patients should be sent to nearby dispensaries or hospitals This is a good opportunity for the local African population to observe that the achievements of European medicine are superior to the results of the primitive practices of the country Static medical units such as rural dispensaries should then be established and all diseases and all patients treated Finally treatment should be completed by travelling units attached to the static units

Gold Coast

After mass treatment, arrangements must be made for resurvey and treatment of infectious cases for a considerable time Bisglucol (0 2 g of metallic bismuth per ml) and acetylarsan as now used have given good results, and are convenient and cheap Some technically simple serological diagnostic test is needed to assist in the assessment of the results of campaigns Resurvey and treatment should be carried out at 6 monthly intervals Dr G F T Saunders, on experience with bismuth and arsenical preparations, recommends that a campaign should be planned to reduce

yaws incidence to a low endemic level throughout the country However, complete eradication may be attempted in selected areas where soldiers are permanently stationed, the incidence of syphilis in such areas should be carefully observed, as indicating a possible relation between eradication of yaws and disposition to syphilis in a community He considers the organization of medical field units to be suitable for the treatment of yaws, but since it is widely believed by Africans in the Gold Coast that the treat ment of the secondary eruption makes the patient more liable to tertiary ulceration steps should be taken before the campaign to assure the people that every case of tertiary yaws that may occur in the future will be ade quately treated Sodium bismuth tartrate cures the majority of cases and when it fails acetylarsan or neoarsphenamine should be used The help of chiefs should be sought to report infectious cases

enya

Eradication of yaws is not yet considered possible, the purpose of anti s work in this country is the reduction of the disease to a low endemic l by providing free treatment through a wide network of scattered ensaries, together with general sanitary measures

mbique

ecific periodic campaigns are essential for the eradication of yaws ..ved and increased rural treatment facilities are also important Underdeveloped populations must be taught the importance of yaws and what treatment can achieve, so that treatment will be sought Thorough trials with penicillin are needed to find how best to use it especially as it is easy to administer and is non toxic Twice-yearly surveys should be con tinued to control yaws and to recognize and treat other diseases syphilis especially should be combated The co operation of chiefs is important Finally the anti yaws work, which should initially be undertaken by special teams would be taken over by the health services of the territory

Nigeria

The experience of antitrypanosomiasis campaigns will be valuable Resurveys should be made by trained African staff under supervision A satisfactory field serological test is required

Nyasaland

As this country is surrounded by areas in which yaws is endemic, the reduction of the disease to a low endemic level should probably be the objective In addition to the increased cost of eradication there is the risk of infection being introduced from outside unless the adjacent countries

at the same time undertake eradication measures A large labour force traverses Nyasaland each year Emphasis is again placed upon the difficulty of carrying out serological control in relatively inaccessible areas To control the reappearance of yaws, little reliance should be placed upon minor chiefs as their interest would soon wane, African medical orderlies, employed at dispensaries, and sanitary staff to visit villages and seek yaws cases, would be the most important elements in this effort At the same time as the anti yaws campaign, a clinical survey and an anti venereal *disease campaign should be undertaken and an attempt made to extend* knowledge about health among the people

Portuguese Guinea

Campaigns should be planned, at present, to reduce the number of infectious cases by effective treatment of all patients The work should be integrated with the mobile health and prophylactic services against endemic diseases The organization would follow the lines of antitrypanosomiasis work The dri

short courses

be carried out

should be based chiefly on clinical observation After the campaign, dispensaries should be established to provide treatment and also case seeking by the orderlies in charge The help of chiefs must be obtained Resurveys should be carried out at intervals of 3 6 months At the same time every *effort should be made to raise the standards of culture and life,* and to improve economic conditions and rural and individual hygiene

Sierra Leone

Harding[8] points out that in planning an anti yaws campaign the long latent period which may be followed by infectious relapse and the tendency to spontaneous healing in the dry season, must be taken into account To deal with these the campaign must include (*a*) a census survey mass diagnosis and treatment, followed by (*b*) strategically placed permanent treatment centres not more than 10 miles (16 km) from the farthest patient served, and (*c*) itinerant yaws attendants to tour the villages

He considers the possible objects of an anti yaws campaign to be as follows

(1) eradication of the disease ,

(2) elimination only of infectious forms of the disease with the intention of stopping transmission,

(3) reduction of yaws to a low endemic level when suffering and economic loss are not serious,

(4) alleviation of symptoms by treating patients who voluntarily seek treatment

He thought at that time (1949) that eradication was not possible The ...mprovement of public health, education, economics and native tradition ...eded to reduce appreciably the transmission of yaws would require ...any decades Therefore, chemotherapy must remain the chief weapon ...West Africa The difficulties in eradicating yaws by a short term intensive ...tment include (a) relapses after treatment (b) relapses in patients ...he latent secondary stage at the time of mass treatment (c) the impossi...bility of inspecting 100% of a population, and (d) the impossibility of iso...lating a community from outside influences and hence the continued risk of an epidemic of yaws among the uninfected children He refers to the experiences of Lambert [11] in Western Samoa

Harding is not satisfied that when yaws is eradicated syphilis will not replace it It must be remembered that he had had no field experience with penicillin He regards the reduction of yaws to a low endemic level as the only practical aim but does mention the theoretical consideration of basing ...treatment on a serological survey

Harding stresses the importance of the establishment of the treatment facilities referred to above in the combating of other endemic diseases such as ankylostomiasis, bilharziasis ascariasis and amoebiasis, but does not think much progress would be made against them without initial mass treatment Such treatment reduces the amount of yaws to a manageable quantity and, equally importantly accustoms the people to the necessity for adequate therapy (In Africa it has often been suggested that the potency of anti yaws remedies should be used to gain the confidence of African ...communities before the application of other aspects of modern knowledge ...o their health problems) At the more successful dispensaries and with ...e help of the local chiefs, 80% 90% of yaws patients attended for six ...jections

Spanish Guinea

Ideally, eradication should be aimed at but the difficulties involved limit the activity to reducing to a minimum sickness due to yaws Neighbouring countries must also undertake anti yaws measures Neoarsphenamine and bismuth preparations are satisfactory Close supervision is necessary after mass treatment to combat infection relapses and new cases Resurveys should be carried out annually Every effort should be made to improve the living conditions of the people, especially as regards dress bodily cleanliness, housing and reduction of overcrowding Yaws is ...a difficult disease to combat but if anti yaws measures were put into action by mutual agreement and simultaneously in all African countries where yaws is endemic, the incidence could be reduced in time The basis of anti yaws campaigns should consist of (a) isolation of patients (b) their rapid and simultaneous treatment, (c) supervision of treated patients and

search for new cases and the source from which the infection arose, and (*d*) disinfection of houses from which patients have come

Uganda

The reduction of yaws to a low endemic level is possible, but would be *of only temporary benefit The eradication of yaws is desirable but* unattainable without far more intensive efforts than appear practicable A separate anti yaws team dealing only with this one problem seems the best means The European in charge should eventually cover a wider field *and be available to supervise follow* up campaigns *A technique based* upon statistical methods, is needed for sampling the population to be surveyed Existing methods, such as choosing a "representative" area may be misleading Bismuth alone is inadequate, arsenicals or antibiotics are essential *In the absence of serological control, the healing of infectious* lesions appears an adequate clinical indication of cure, but relapses may occur later To prevent the reappearance of yaws requires much effort such as planned or surprise surveys, assistance of health staff to report cases seen during their inspections, co operation of chiefs education of parents, and emphasis on the need for early treatment It is possible that early resurveys should be at intervals of 3 weeks until no further cases develop, thereafter the interval would be extended Contacts and sources of infection should be sought *Health* education on broad principles *should* be attempted while the campaign is in progress

Suggestions for Control of Yaws by Other Means than Chemotherapy

Anglo Egyptian Sudan

Village planning, health propaganda, and educational activities

Belgian Congo

Improvement of hygiene such as personal cleanliness better clothing use of separate beds, and destruction of flies

Gambia

Improved hygiene and housing is essential, in addition to treatment

Gold Coast

Improved health services and education of the population regarding the prevention of diseases Dr G F T Saunders is not satisfied that enough is known at present of the epidemiology of yaws for any method except chemotherapy to be used

Kenya

The improvement of hygienic and living standards are complementary to chemotherapy but not a substitute for it

Mo amb que

"Since it is generally accepted that the propagation of yaws can also take place through the agency of fleas and bugs it is obvious that the fight aga nst the d sease with the drugs at present in use should be accompanied by campa gns against these insects "

geria

The stressing in health propaganda especially for schools of the impor ice of improved housing conditions and personal hygiene That edu on will eliminate yaws in due course is almost certain

uguese Guinea

In the present state of knowledge there is no alternative to intensive chemotherapy since it not only eliminates sources of infection but also controls relapses

Tanganyika

Like so many other diseases in Africa improvement in the hygiene and sanitation housing and general welfare of the people is an important adjunct to the prevention of yaws

Uganda

It should be pointed out to Africans that it is possible to live in yaws areas and by wearing clothes and avoiding close personal contact with infectious patients escape infection They should at least be encouraged to avoid undue contact with infectious patients It should be stressed that the disease is associated with dirt ignorance and apathy

Have Anti Yaws Measures Been Associated with Any Increase in Venereal Syphilis ?

'nglo Egyptian Sudan

In Nilotic areas no such association has been noted In Zande district the border of the Congo and French Equatorial Africa yaws was at one time considered to be endemic It is rarely seen now and the incidence of syphilis has increased The appearance of this higher incidence however is in part at least, a result of the increased medical facilities and of more

comprehensive medical services and greater confidence in them Additional contributory factors are social changes in tribal life with lessening of parental control, and economic changes which have made the young less dependent on their parents

Belgian Congo

In 1940, 73 266 cases of syphilis and 226 525 cases of yaws were treated, in 1950 these figures were 95,770 and 244,570 respectively The maximum figures for syphilis occurred in 1948 and 1949 when 103,458 and 100 823 cases were treated, the maximum figures for yaws were 286,711 and 282 436 in 1943 and 1944 Van Nitsen [11] writes

It would appear, from observations made both clinically and in laboratory animals, that on the one hand, 'the interruption of the natural evolution of yaws by treatment seems to retard the development of immunisation, and on the other hand that yaws confers a certain immunity vis à vis syphilis

" In view of this it might be asked if it would not be better to forego all treatment, so that the patient could develop as quickly as possible this natural immunity which would protect him not only from re infection but also from syphilis

We do not believe this Though treatment might slightly increase the possib l ty of re infection it does not seem to us to be very serious Moreover it is important for the patient that he should have sufficiently active and prolonged treatment to protect h m from tertiary lesions, which are far more troublesome than a re infection

" The loss of immunity to syphilis following the loss of immunity to yaws is certainly much more serious Unlike yaws congenital syphilis from the point of view of the race is a grave danger However evidence of cross immun ty in man is far from decisive

the Belgian Congo

The risk of syphilis becoming rapidly generalised is very small and even negligible in comparison with the possible consequences of untreated yaws

Yaws in its later manifestations is a very serious disease, both for the individual and the race as a whole and it should be fought with all the powers at our command regardless of the altogether unlikely eventualities which eradication might bring "

Gold Coast

There is no record of an increase of syphilis in areas where yaws has been treated in anti yaws campaigns

Kenya

Measures against yaws have been associated with an increase in syphilis but ' this is fortuitous as the increase in syphilis is thought to be due to a greater contact with civilisation Gonorrhoea has increased at the same time "

Mozambique

No anti yaws campaigns have been carried out, but the number of cases of "syphilis" and "gonorrhoea and other venereal diseases" treated has risen from 22,770 and 8,382 respectively in 1945 to 30,799 (35% increase) and 15,391 (84% increase) in 1950 (yaws had increased from 44,757 to 62,791, i e, 40%) The increase in venereal diseases is probably partly due to the return of labourers working in neighbouring territories In certain parts of Mozambique the Africans themselves "adopt rigorous measures to control those who return to their own country by preventing them, sometimes by violence, from having sexual relations"

Nigeria

"In these areas where yaws once flourished and is now greatly on the ecline, no increase in syphilis has been observed"

asaland

It is impossible to say whether anti-yaws measures have been associated ı an increase in syphilis since economic development, wars, and relaxation of the social code are also important factors

The Wankonde, living in the yaws area of Karonga on the shore of Lake Nyasa, are the most conservative tribe in the country and are relatively highly educated because of the work of the Livingstonia Church of Scotland Mission Their country is in the most remote district of Nyasaland and at present there is only one European planter in the area Their chief is a priest-king who has more authority over his people than any other chief in Nyasaland Syphilis was rare and occurred mainly in immigrants from an adjacent tribe A dowry system was in force and girls were examined to ensure their virginity before marriage Literacy was high among men, but fathers refused to send their daughters to the boarding school at Living-tonia because of the lower moral standards of the local tribe Up to the utbreak of the second World War, few men went south to Southern Rho sia or the Union of South Africa A few went into Tanganyika where people are tribally similar and, before European political divisions were de, came under the Wankonde paramount chief Diet was a limiting actor in movement south since the staple food of the Wankonde was bananas and milk, and they were not attracted by the maize and beans of the rest of Nyasaland, the Rhodesias, and the Union of South Africa Now, apparently, the isolation of the tribe is fast breaking down Many Wankonde joined the army in the second World War while few did in the first, and many go south to work in the Witwatersrand mines in the Union of South Africa At the Karonga District Hospital in 1931, there were 35 cases of syphilis and 13 of gonorrhoea, in 1950 the corresponding figures were 287 and 72, an increase of eight- and five fold

Portuguese Guinea

In areas where large numbers of yaws patients have been treated, no increase of primary syphilis has been observed Syphilitic patients in these areas are usually immigrants from outside the area Syphilis is relatively rare among the African population, the most important venereal disease being gonorrhoea

Sierra Leone

No increase of syphilis has been noted in areas where yaws campaigns have been carried out

Spanish Guinea

Syphilis is most frequent in centres of population along communications

Tanganyika

In some areas the decrease in yaws has been followed by an undoubted increase in venereal syphilis, but this is generally attributed to the war and the breakdown of moral and tribal standards All venereal diseases have increased in the past 10 years

Uganda

No data are available

Attitude of the Population in Endemic Areas Towards Anti-Yaws Measures

In general, anti-yaws campaigns and treatment at clinics are well received, but it is unusual for patients to attend regularly to receive full treatment In the *Gold Coast* Dr G F T Saunders points out the difficulty of getting co-operation in eradication campaigns, since the population believes that early treatment makes the patient more liable to develop tertiary lesions In *Mozambique*, in the less developed communities, yaws is regarded with shame and the patient avoids his neighbours and does not seek treatment This results in numerous cases of gangosa, other mutilations, and serious bone lesions—particularly of the lower limbs—with reduction of working capacity In more developed communities treatment is readily sought early In *Nigeria* a belief, in some areas, that a child would not be healthy unless it developed at least primary yaws is now disappearing In *Nyasaland* patients report late and attend only until clinical cure, while in *Spanish Guinea* attendance is early and usually satisfactory In *Uganda* anti yaws

ampaigns are much appreciated and more of them are requested, but ttendances at clinics are not so enthusiastic, although arsenical preparations re often demanded This reaction to clinic treatment may be related to the istance the patient has to travel, usually on foot, to reach it

Most Effective Means of Getting Full Co-operation of Patient So That Complete Courses of Treatment are Received

nglo-Egyptian Sudan

The most effective measure is the increase of the number of properly rganized treatment centres, which are sited after consultation with chiefs, hose influence can greatly improve regularity of attendance for treatment

elgian Congo

Case seeking and the co-operation of village chiefs and of school and ligious teachers are important

old Coast

The influence of chiefs is most effective, and if possible they should be ade responsible for ensuring the complete attendance of all patients it is only the chief who can trace the abode of the defaulter, those engaged in anti yaws work usually have little time for this

Mozambique

Effective treatment of short duration, and propaganda by talks and posters stressing the benefits of treatment and the serious consequences of its lack, would gain the full support of patients

Lists of patients should be prepared, and chiefs made responsible for their regular attendance

Nigeria

Propaganda during initial surveys is the best method of ensuring co operation

Nyasaland

The most effective propaganda is demonstration of the results of treat ment by illustrations and films, and then by patients before and after treatment Treated patients should be encouraged to spread the news and stress the importance of full treatment The influence of chiefs varies in different places Newspaper propaganda has a limited range and is regarded with

Discussion

In many African countries no anti yaws campaigns have been under taken This must not be regarded as an indication of neglect by those responsible for the health and welfare of the African Africa has had its special problem of trypanosomiasis which, until a few years ago, was estimated to have been responsible for about 50,000 deaths annually for the past 50 years In the past half-century great efforts have been made to control this disease These efforts have been so successful that it would be reasonable to say that present knowledge of the natural history of the disease and its tsetse-fly (*Glossina* species) vector, together with the development of chemotherapy and residual insecticides, has made the prevention of severe outbreaks with high mortality, such as occurred in Uganda at the beginning of this century, almost certainly practicable Malaria control, too, has occupied much attention, as have, recently, nutritional problems More could have been done to combat yaws, but it must be realized that other more urgent and serious health problems have had much attention

A variety of arsenical and bismuth preparations have been used in the treatment of yaws, but there are difficulties in adequately treating an African peasant population, living under rural conditions, with these substances Chief among these difficulties are

(1) The avoidance by some tribes of treatment in the early stages of the disease in the belief that treatment at that time creates a predisposition to tertiary lesions

(2) The almost universal tendency of outpatients to cease treatment as soon as clinical cure has occurred Although in a few such cases serolo gical reversal may also have occurred, this is very infrequent

(3) The incidence of stomatitis in association with bismuth treatment, and even of severe illness and groups of fatalities Although the first is often mild and the last not frequent, bismuth cannot be regarded as com pletely harmless The toxicity of arsenical preparations is well known

(4) From four to six injections or pairs of injections at 5- to 7-day intervals are usually recommended, and in an anti yaws campaign this ties down staff and equipment for long periods In a recent campaign drugs took 37%, salaries of European and African staff 36%, and travelling expenses 19%, of the total cost

Many anti yaws campaigns appear to have been inadequately planne An adequate preliminary survey may not have been made so that the fin results cannot be accurately assessed, or mass treatment may not ha been followed by measures to combat the reappearance of infectious lesion so that 2 3 years later the population appears to have received no lastir benefit

In some areas anti yaws work has followed antitrypanosomiasis work, as the latter disease comes under control Not only does this keep the control unit fully occupied, but it also reduces the possibility of arsenical preparations used against yaws producing arsenic resistant strains of trypanosomes

In anti yaws campaigns where treatment is not merely made available to the population but is brought close to them, as by the appointment to each village of a yaws attendant, selected by the village chief, or by medical attendants seeking and treating primary or secondary cases found during specific visits to villages, reduction of secondary yaws can be anticipated, and, if these measures are continued, reduction of tertiary yaws and even, ultimately, complete control may be expected It has been shown in Africa, and in other parts of the world, that unless close supervision of the treated community is maintained the incidence of infectious lesions soon rises It should be borne in mind that although, before mass treatment, ignorance may be an excuse for a patient not seeking early treatment, after such a campaign laziness or pressure of work may remain as causes

Unless the results of any anti yaws measures are checked by surveys, and reports made on changes in the social and other conditions of the population, it may be quite impossible definitely to attribute a decrease in yaws to any anti yaws measures carried out years earlier

In some parts of Africa the incidence of infectious and other yaws lesions decreases during the dry season so that the season when a survey was made must be taken into account

In eastern Sierra Leone where the late Dr R D Harding carried out his excellent work, permanent treatment centres with itinerant attendants were finally established to treat trypanosomiasis yaws, and other diseases Two maternity centres, where midwives were trained, were set up with the help of a woman doctor and nurses from a nearby mission Village planning was carried out, water supplies improved, and fruit trees planted round the treatment centres so as to encourage their wider cultivation

Harding [7] also carried out population studies in some of the areas in which he was working His resources were not unlimited, but it would be generally agreed that, by undertaking what he thought he could accomplish, he and his team achieved much He emphasizes that all these activities and the success which attended them would have been impossible without the confidence which successful treatment of trypanosomiasis and yaws had created in the Africans, and the close contact between the population and staff arising from the mobile character of the campaign

Apted [1] continued to work in the same area in Sierra Leone and found that five injections of bismuth salicylate gave results inferior to those obtained with acetylarsan However, he thought that for mass treatment of the yaws seen in the area, where the majority of patients had non infectious plantar lesions, bismuth salicylate was adequate since further treatment was readily available

Harding [8] reports that the cost of the campaign in 1946, including salaries of two European medical officers and of African staffs, equipment, buildings, and transport for 10,400 yaws cases and 1,530 trypanosomiasis cases, was under 20 shillings (less than $3) per patient The cost of treating at the same time, 28,700 patients suffering from other diseases was only the cost of the drugs and dressings required for them The cost per patient of the 1949 50 anti yaws campaign in Lango, when 25,585 of a population of 268,600 were treated, was slightly more than 6 shillings ($0 84), but no other activities were undertaken

It is reported that in the Mayumbe area of the Belgian Congo, although the FOREAMI activities halved the case incidence of yaws in three years by the use of three injections of bismuth and five of neoarsphenamine at weekly intervals, 12 years after the departure of FOREAMI, during which eight injections of bismuth were given at intervals of 2 weeks, the yaws incidence was at its original level

In some countries, treatment of yaws at established clinics is reported to have produced at least a local fall in the incidence after some years It is probable that where this has happened arsenic preparations in addition to bismuth are used and rural dispensaries are numerous Many anti yaws activities have had to depend upon clinical rather than serological assessment, if this be a necessity, then the period of observation must be longer, perhaps at least 3 years, with frequent surveys, before a reliable conclusion can be reached

Botreau-Roussel [3] *points out that, though it might seem that an effective* drug that can be given by mouth would be almost ideal, experience in the Ivory Coast soon showed that this was not so, and parenterally administered drugs were again adopted

Colbourne et al ,[4] from their study of a small Gold Coast village which was only 3 miles (5 km) from a clinic, say that the only value of the treatment (given when patients sought it) was to render a few cases probably temporarily non-infectious However, only 3 severe tertiary lesions and 2 primary ones were seen in the total population of 255, of whom 57% gave positive Kahn reactions This incidence of primary and severe tertiary lesions might possibly be found in an untreated community

In Tanganyika, where five to six weekly injections of arsenical bismuth preparations are the routine treatment for yaws, the incidence of cases treated has gradually fallen from 120,000 in 1927 to 52,000 in 1950

In the past too little attention has been paid, when assessing the effects of treatment to the age of the patients and the duration of their infections It is regrettable that too often only the proprietary names of the preparations used are given, without any indication of their chemical composition The experience of Harding,[8] who was getting unsatisfactory results with BSPT which he eventually learned contained only 4 34% bismuth instead of the usual 58%, stresses the need for recording the quantitative composition of

preparations used Field experience in the use of residual insecticides seems to indicate that the quantitative composition recorded should not merely be that stated on the label but also that determined by independent analysis In any careful study, dosage would be related to body weight

In practically all countries the treatment of yaws, as of all diseases, is free in Government establishments In most countries injections for the treatment of yaws are greatly appreciated by the local population, but if given their choice they would prefer intravenous arsenical preparations to intramuscular bismuth on account, they would say, of the greater efficacy of the former

Stress must be laid upon the uncertain value of figures for attendances at dispensaries or other rural medical units Wet weather, seasonal agricultural or other occupational demands, establishment of other units nearby, etc, may all influence attendance In many countries the records kept at such units are of attendances and not of cases, so that each attendance of a case is counted The only satisfactory figures for any extensive planning are those obtained by trained survey teams

In the planning of anti yaws campaigns in most countries it is thought that, with arsenical or bismuth preparations, eradication is not practicable It is generally felt that chemotherapy is at present the most important method of treatment, although education and raising of standards of living and health should not be neglected While some think that in our present ignorance of the transmission of yaws it is impossible to teach prevention successfully, there are a few workers who think that education could ultimately eradicate yaws More important difficulties are the proximity of neighbouring countries where anti yaws measures may not be very active, and the transit of a country by large numbers of African labourers Hence the usual intention is to reduce yaws to a low endemic level where it will not be a serious disease, or a cause of suffering or economic loss

The scheme Harding * evolved in Sierra Leone was based upon the political unit of a chiefdom with an average population of about 7,000 The first step was the accurate listing of the population by a census team of about five African scribes under the supervision of a European administrative officer Surprise visits to villages already listed should be made to ensure that no evasion is occurring This team also built shelters in which diagnosis and treatment, and the start of the health education of the people, could take place

Next the medical team, consisting of a medical officer and up to eight African medical attendants, visited the villages and examined 500-600 patients daily Diagnosis was based on clinical examination, mainly visual Children were naked but adults remained covered from waist to mid thigh Infectious secondary lesions and palmar and plantar lesions were sought An inquiry was made as to whether the patient had had any secondary yaws lesions, and whether any treatment had been received during the

previous three years The following types of patient were selected for treatment

(1) all with infectious lesions,

(2) those with dry skin lesions, such as macules, papules, and ring worm like lesions, who were considered likely to suffer infectious relapses later,

(3) those under about 30 years of age with non-infectious plantar lesions Patients over this age with these lesions were treated, however, if the lesions were incapacitating, otherwise treatment was left to the will of the patient

Treatment consisted of four double injections of arsenical and bismuth preparations at intervals of 5 7 days To give this to about 850 cases, diagnosed out of the 7,000, at two centres took 5 6 weeks Thus with one census team and two treatment teams a population of about 120,000 per annum could be dealt with if the population density were 50-100 per square mile (20-40 per km²) With the active assistance of chiefs, up to 98% of the listed population can be obtained for examination, and in the case in question 95% or more of those to be treated received a minimum of three pairs of injections

Harding considered that two essential parts of the later development of the anti yaws campaign were (*a*) the establishment of treatment centres so that no patient had more than 10 miles to walk to reach one, and (*b*) the travelling out from these centres of attendants to seek and, if necessary, treat infectious patients who will not or cannot attend at the centre By these measures, in one chiefdom he was able to eradicate infectious yaws lesions in less than 18 months and greatly to reduce non infectious plantar lesions However, the removal of treatment facilities was followed by the reappearance of infectious yaws to half the original level within 7 months. Other groups of patients who received similar treatment remained relatively free from infectious lesions for 4 5 times as long These infectious patients were probably suffering relapses of infections that at previous surveys had been in the latent secondary stage He thinks surveys and treatment should be carried out 3 4 times a year, for several years, to prevent the reappearance of yaws Contacts and sources of infection should be sought It may be said that the reduction of yaws to a low endemic level is possible, but of only temporary benefit unless control measures are continued

The experience in the Springs Mines outbreak of yaws in 1942* is of value as regards control The outbreak was first recognized in February and the following control measures were instituted

(1) All Africans from the affected section of the mine were examined once every 14 days, this examination was continued until 4 months after

* See paper by Hackett on page 129

the last case occurred Close observation was kept in several other ways to recognize infections

(2) Patients were isolated in hospital until non infectious and given six weekly injections of neoarsphenamine and bismuth

(3) The compound rooms from which patients came were thoroughly disinfected and the contents fumigated

Despite these measures, which would be extremely difficult to apply in tropical field work, from February to December 67 cases (16 75%) occurred out of a population at risk of 400, and the last case did not occur until towards the end of May of the following year It was presumed that the infection was brought in from yaws endemic areas by Africans in the latent secondary stage, who relapsed—perhaps on account of the warm humid conditions which would have resembled the climate of the tropical wet season

Data relating to some of the infected Africans in this outbreak suggested that at least 6 weeks elapsed from the time of infection to the development of secondary eruption, and that from 22 160 weeks had passed between the time the African was engaged to work in the mine, after medical examination, and the time when secondary yaws appeared, probably from the relapse of a latent infection The information on this outbreak is owed entirely to Dr H H Wright, Chief Medical Officer, Springs Mines, Ltd

In view of these possibilities, it might be suggested that, after mass treatment, surveys to find infectious patients should be made frequently during the wet seasons, for at least three years if effective control is to be exercised

In addition to treating trypanosomiasis and yaws the medical centres established by Harding[8] during the campaign treated a number of other endemic infections that were susceptible of cure Opportunities were also taken to improve water supplies housing, and midwifery facilities The broad principles of the maintenance of health should be simply taught Population studies, which are so urgently needed in all parts of Africa, might also be made

Harding stresses that close contact with the population in the early stages of the campaign resulted in the teams' winning its confidence The co operation of chiefs is very important and can greatly increase the efficiency of all measures The mass treatment of yaws reduced infection to manageable proportions and accustomed the people to the necessity of adequate therapy The successful treatment of this disease might well serve as an introduction to Africans of the possibilities of the application of modern knowledge by careful and adequate planning

A technique, based upon statistical methods, is needed for sampling a population to be surveyed A warning should be given against propaganda during the initial survey if future action is to be based upon the findings of the survey In areas where it is thought that early treatment produces

predisposition to tertiary lesions, the people should be assured that all tertiary lesions will be thoroughly treated

Control of yaws by means other than chemotherapy does not offer very good immediate prospects, nevertheless more attention should be paid to possible avenues of investigation It is of little use to suggest that improvement in hygiene, housing, clothing, etc, is essential The difficulty is to achieve such improvements An area or population should be selected and a serious trial carried out there Such an approach, though it might appear more expensive than chemotherapy, would also control a number of other diseases and might well ultimately prove cheaper While such a trial is proceeding, an intensive epidemiological study of yaws should be made It might be stressed to Africans that yaws is a disease associated with dirt ignorance, apathy, and usually poverty It disappears as 'civilization" advances No measure should be neglected that will gain the co operation of the community

An important and inadequately answered question is If yaws is eradicated will syphilis increase in the community? In some areas when the incidence of yaws has decreased syphilis has increased but other factors have also changed, such as the isolation and mobility of populations and their social conduct, or economic status Van Nitsen [14] in the Belgian Congo thought that the risk of "syphilization" of the community freed from yaws was not very serious, and was negligible compared with the possible consequences of untreated yaws However, Mouchet [13] said that if the incidence of syphilis in a community approached that of yaws in the Belgian Congo, the population would rapidly disappear It cannot be without significance that there are communities among whom yaws is almost universal and syphilis is absent

It must be admitted that the problem of cross immunity has been inadequately studied in man In experimental animals much work has been done which indicates that syphilis and yaws may produce immunity against each other, and also that the treatment of either infection in the early stages leaves the animal susceptible to further infection with either disease The African miner, mentioned by Hackett,[f] who was infected with yaws while working deep underground whose serum became Wassermann negative following treatment and Wassermann positive a few months later, when a penile chancre was found, may be only a single case, but a number of essential facts about that patient are known from direct observation and not merely from his statements Such cases cannot be abolished at will Few would agree with van Nitsen that, compared with the serious damage that may occur in yaws the risk of a rapid and widespread introduction of syphilis is very small and even negligible This question is further complicated by the inadequate knowledge of the damage caused by venereal syphilis in Africans

[f] See page 167

Together with powerful modern drugs and the present knowledge of how to conduct anti yaws campaigns, careful planning and execution are essential These campaigns are not suitable as exercises for inexperienced men untrained in the necessary techniques It would appear that the principles of adequate anti yaws activities are not generally known and an authoritative statement, based on field experience, which would stand critical examination would be extremely useful

There is a great need for accurate clinical and statistical records, collected after purposeful planning so that results from different countries will be comparable The results of all anti yaws activities should be correlated The clinical manifestations of yaws are not yet fully understood The proportion of primary, secondary, and tertiary lesions in a community should give some information on the adequacy of the recent treatment that has been received Serological tests will detect infected patients, but what is urgently required is some way of distinguishing latent secondary from latent tertiary cases or, in other words, those latent cases that may suffer infectious relapses from those that will not Perhaps some intradermal sensitivity test may yet be devised

Annex 1

QUESTIONNAIRE ON CONSOLIDATION PHASE OF YAWS CONTROL DISTRIBUTED IN AFRICA, AUGUST 1951

I **Present anti yaws campaigns**

(1) Were they preceded by surveys ?

(2) What type of case was treated ?
- (*a*) only infective secondary cases
- (*b*) all yaws cases
- (*c*) only those that sought treatment

(3) Drugs used dosage number and spacing of injections

(4) Did any toxic manifestations occur ?

(5) Cost of campaign and by whom financed ? Was treatment free or were patients charged for each injection ?

(6) Number of patients treated and total of population at risk

(7) Results
- 1 serological
- 2 clinical
  - (*a*) *incidence of yaws in community before campaigns* ascertained by
    - (i) survey (ii) clinic attendances
  - (*b*) incidence 1 2 3 etc years after anti yaws campaign of
    - (i) new primary lesions (iii) secondary relapses
    - (ii) new secondary lesions (iv) tertiary lesions

predisposition to tertiary lesions, the people should be assured that all tertiary lesions will be thoroughly treated

Control of yaws by means other than chemotherapy does not offer very good immediate prospects, nevertheless more attention should be paid to possible avenues of investigation It is of little use to suggest that improvement in hygiene, housing, clothing, etc., is essential The difficulty is to achieve such improvements An area or population should be selected and a serious trial carried out there Such an approach, though it might appear more expensive than chemotherapy, would also control a number of other diseases and might well ultimately prove cheaper While such a trial is proceeding, an intensive epidemiological study of yaws should be made It might be stressed to Africans that yaws is a disease associated with dirt, ignorance, apathy, and usually poverty It disappears as "civilization" advances No measure should be neglected that will gain the co operation of the community

An important and inadequately answered question is If yaws is eradicated will syphilis increase in the community? In some areas when the incidence of yaws has decreased syphilis has increased, but other factors have also changed, such as the isolation and mobility of populations, and their social conduct, or economic status Van Nitsen[11] in the Belgian Congo thought that the risk of "syphilization" of the community freed from yaws was not very serious, and was negligible compared with the possible consequences of untreated yaws However, Mouchet[12] said that if the incidence of syphilis in a community approached that of yaws in the Belgian Congo, the population would rapidly disappear It cannot be without significance that there are communities among whom yaws is almost universal and syphilis is absent

It must be admitted that the problem of cross immunity has been inadequately studied in man In experimental animals much work has been done which indicates that syphilis and yaws may produce immunity against each other, and also that the treatment of either infection in the early stages leaves the animal susceptible to further infection with either disease The African miner, mentioned by Hackett,[f] who was infected with yaws while working deep underground, whose serum became Wassermann negative following treatment and Wassermann-positive a few months later, when a penile chancre was found, may be only a single case, but a number of essential facts about that patient are known from direct observation and not merely from his statements Such cases cannot be abolished at will Few would agree with van Nitsen that compared with the serious damage that may occur in yaws, the risk of a rapid and widespread introduction of syphilis is very small and even negligible This question is further complicated by the inadequate knowledge of the damage caused by venereal syphilis in Africans

[f] See page 167

Together with powerful modern drugs and the present knowledge f how to conduct anti-yaws campaigns careful planning and execution e essential These campaigns are not suitable as exercises for inexpe-nced men untrained in the necessary techniques It would appear that the principles of adequate anti yaws activities are not generally known and an authoritative statement, based on field experience, which would stand critical examination would be extremely useful

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(a) incidence of yaws in community before campaigns ascertained by

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(i) new primary lesions (iii) secondary relapses

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(8) Arrangements for supervision and treatment after campaigns by
  (a) dispersed treatment centres
  (b) search for and treatment of infective cases

(9) What other medical or welfare activities were undertaken at the same time as the anti yaws campaign ?

II Past anti yaws campaigns

(under same headings as I above)

III *Effect of anti yaws treatment at established general medical clinics*

(1) Treatment free
(2) Treatment paid for, at least in part by patient
(3) Drug used and approximate numbers (and spacing) of injections received

IV **Recommendations, based upon experience, for conducting anti yaws campaigns**

(1) Purpose of campaign
  (a) reduction of yaws to low endemic level
  (b) eradication of yaws
(2) Organization
  (a) planning
  (b) surveys
(3) Drugs
  (a) effectiveness
  (b) practicability as regards effectiveness and cost
  (c) spacing and dosage
(4) Control of results by serological and clinical methods
(5) Action after campaign to prevent reappearance of yaws what form and by whom (e g medically trained dressers minor chiefs etc)
(6) At what intervals and for how long should re-examination and further treatment be carried out ?
(7) What other medical or welfare activities should be undertaken at the same time as the anti yaws campaign ?

V. **Can you make any suggestions for the control of yaws by other means than chemotherapy ?**

VI **Have measures directed against yaws been associated with any increase in venereal syphilis ?**

(1) Might any other change of conditions have played a part in this—*e g economic development, relaxation* of social code of conduct or immigration of people from other areas where syphilis is prevalent ?
(2) Has there been any increase in other venereal diseases, e g , gonorrhoea or chancroid ?

VII **Attitude of the population in endemic yaws areas**

(1) Towards anti yaws campaigns
(2) Towards anti yaws treatment at clinics

VIII Most effective means of getting full co-operation of patient so that complete courses of treatment are received

(1) Name lists (as in antitrypanosomiasis campaigns)

(2) Influence of chiefs

(3) Propaganda during survey preceding campaign

(4) Propaganda by itinerant story-tellers newspapers etc

IX What measures have been taken to educate yaws communities regarding the transmission and prevention of the disease ?

Are these likely to be important in the control of yaws ?

X What papers on anti yaws campaigns and their results in the country have been published ?

XI Any other remarks

ACKNOWLEDGEMENTS

It is a pleasure to acknowledge the help I have received in the preparation of this paper from the persons named in Annex 2 of my earlier article * and from Mr R V Sayers and his staff of the Language Unit of Burroughs Wellcome & Co Ltd London

SUMMARY

Yaws occurs in underdevel ed com munities which are usually poorly served *by the established medical services An anti yaws campaign* is regarded for the present purpose as a series of events in which some specific activity is directed against the disease in addition to the *general activity of the* established medical service The consolidation phase thus really consists of the local development of wider medical facilities from anti yaws *measures If* African trypanosomiasis is also present the *campa gn should be* d rected first aga nst this disease and later aga nst yaws *The success* of measures against these two diseases lies in gaining the confidence of the African population and with this confidence the introduction of therapeutic and *preventive activities* against other diseases can be initiated Thus it is probable *that the ideal* rela t onship between yaws control and other

RÉSUMÉ

Le pian sévit dans les collectivités sous évoluées ne bénéficiant pas en général *de services médicaux adéquats Une cam* pagne antipianique est conçue comme une offensive contre cette maladie qui vient s ajouter aux activités régulières des ser vices médicaux La phase de consolidation consiste en fait à developper les services médicaux à partir des mesures prises contre le pian au cours de ces campagnes Si la trypanosomiase africaine et le pian co-existent, la campagne doit porter d abord contre la première de ces maladies ensuite seulement sur la seconde Pour assurer l efficacité des mesures il s agit de gagner la confiance de la population africaine, cette confiance étant acquise des activités prophylactiques et thérapeutiques peuvent être entreprises Il est probable que le rapport le meilleur entre la lutte antipia nique et d autres activités en faveur de la santé s établira moins par l intégration

* See page 175

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Le pian sévit dans les collectivites sous évoluées ne bénéficiant pas en général de services médicaux adequats Une campagne antipianique est conçue comme une offensive contre cette maladie qui vient s ajouter aux activites régulières des services médicaux La phase de consolidation consiste en fait à developper les services médicaux à partir des mesures prises contre le pian au cours de ces campagnes Si la trypanosomiase africaine et le pian coexistent la campagne doit porter d abord contre la première de ces maladies ensuite seulement sur la seconde Pour assurer l efficacité des mesures il s agit de gagner la confiance de la population africaine, cette confiance étant acquise des activités prophylactiques et thérapeutiques peuvent être entreprises Il est probable que le rapport le meilleur entre la lutte antipianique et d autres activités en faveur de la santé s établira moins par l intégration

[1] See page 173

INTEGRATION OF YAWS CONTROL INTO THE PERMANENT HEALTH STRUCTURE OF THE PHILIPPINES

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Yaws has long been recognized as a public-health problem, and attempts have been made to stamp out the disease in the endemic foci of the world, particularly in the Malay States, Ceylon, Thailand, Indonesia, Burma, French Indo China, Samoa, the West Indies, Haiti, and the Philippines The procedure followed in the conduct of the campaign varies in the different countries, but the objective is the same the eradication of yaws Lately, with the assistance of WHO and UNICEF, an integrated yaws-control programme has been inaugurated in Indonesia, Thailand, and the Philippines Field operations in the latter country started on 15 August 1951

Any venture to formulate plans for the yaws-control programme in the Philippines would be incomplete without reference to the investigations on the local yaws problem conducted by prominent scientists in the past thirty years The works of A W Sellards ("Public Health Aspects of Yaws"[7]), A W Sellards & E W Goodpasture ("Summary Concerning the Control of Yaws"[8]), L Lopez Rizal, P Gutierrez & L Fernandez ("A Field Experiment in the Control of Yaws"[2]), and P Gutierrez ("Report of the Commission for the Suppression of Yaws in Parañaque"[1]) are milestones in our increased knowledge of yaws control in the Philippines

Early Yaws-Control Measures

Yaws was reported from different parts of the Philippines as early as 1907 It was observed among cases of leprosy transferred from Albay, in the Bicol region, to Culion, Palawan The spread of the disease, apparently resulting from the cases that were reported in previous years, was also noted at the San Lazare Leper Ward in Manila[3] In 1910, under the direction of Dr Richard P Strong, Ehrlich s new remedy—dioxydiaminoarsenobenzol, popularly known as "606 —was most successfully tried in the treatment of yaws Three years later, requests for the supply of the medicine were received from various parts of the country[4] In 1921, a field experiment in the control of yaws was conducted at Parañaque,

Rizal, by Dr Lopez-Rizal and his associates under the auspices of the Bureau of Health for the purpose of investigating the possibility of extending the yaws campaign throughout the Philippines The work at Parañaque was undertaken by three medical officers and two public health nurses The method employed was a house-to-house survey and examination of cases, they examined a total of 9,308 persons and found 199 persons, or 2 1%, afflicted with yaws Out of the total number of cases, 168, or 84.4%, were under 15 years of age It was also found during this study that more than one case often existed in a family By 1923, the results of the pilot project at Parañaque had encouraged the Bureau of Health to extend the campaign to other provinces The progress of the campaign from 1923 to 1929 may be indicated by the following tabulation showing the number of cases treated during each year

Year	*Number of cases treated*
1923	10,159
1924	20,881
1925	17,932
1926	16,923
1927	13,463
1928	12,645
1929	15,475

Yaws campaigns in the Philippines, while conducted regularly, depended upon the availability of funds Hence, difficulties were always encountered in the formation of special units for control work. In 1937, the yaws campaign received the much-needed sum of 100,000 Philippine pesos, set aside for the purchase of medical supplies to be used by the public dispensaries in the provinces Of this amount, 21,000 pesos were allocated for an extensive campaign against yaws Ten campaign units were assigned to cover the provinces of Camarines Sur, Leyte, Masbate, Palawan, Pangasinan, Samar, Sorsogon, Sulu, and Zamboanga[5] In 1938, an additional amount of 25,000 pesos was set aside for control work, and an additional ten units were organized to cover the provinces of Agusan, Albay, Bukidnon Capiz, Cebu, Cotabato, Lanao, Mindoro, Mountain, and Romblon As a result, 31,647 cases were treated[6] Before the country became involved in the second World War, the number of units in operation was reduced to three, owing to a decrease in the appropriation The estimated cost of operating one unit was then 13,110 pesos per year

back into operation
paign units working
Mindoro, Palawan,
ates Public Health
to treat a number
of cases The latter body, under Mr James E McCall, helped very much

in the treatment of cases in Mindanao, the Bicol region, the Visayas, and the Ilocos provinces

Prevalence of Yaws

Yaws must be considered as one of the most important public health problems of the Philippines It is found in practically all parts of the country, with the greatest prevalence among the non Christian Filipinos in Mindanao and Sulu

The experience obtained from 15 weeks of operation of the Philippines Treponematoses Control Project, carried out with the assistance of WHO and UNICEF in the provinces of Leyte and Samar, has shown that out of 87,263 people examined, 8,816 cases were treated for yaws —giving a prevalence of 10% of the population examined Places with a prevalence as high as 30% have been noted If this picture of yaws prevalence is true of places where periodic yaws campaigns have been undertaken, the prevalence in the provinces of Agusan, Antique, Capiz, Catanduanes, Cotabato, Davao, Palawan, Surigao, Sulu, and Zamboanga, where campaigns were seldom undertaken, may be even higher As the data available are based on fragmentary reports and do not necessarily portray the real prevalence, the situation should be thoroughly studied and the campaign patterned after the one being demonstrated in Leyte and Samar in accordance with the plans formulated by WHO, UNICEF, and the Bureau of Health

The Integrated Control Programme

The treponematoses-control programme in the Philippines commenced field operations in August 1951 Use was made of the initial assistance given by UNICEF, amounting to $147 000 in supplies and equipment and calculated to cover the requirements for two years of five yaws-control teams and ten units for treatment of syphilis among mothers

The plan of operation consisted of two parts

(1) the control of yaws in the provinces of Leyte and Samar, with a combined population of 1,718,000 ,

(2) the control of maternal syphilis, which falls beyond the scope of this paper It is expected that 75% of the population, or 1,288,000 persons, will be examined and that of these, 8%, or about 100,000 persons, will receive treatment Five teams and two field serological laboratories are now working for the realization of this objective

The short period during which this programme has been in operation in the provinces mentioned has demonstrated the practicability and efficiency of the plan and methods of work

General considerations

Fully to appreciate the idea behind the proposal to integrate yaws control into the permanent health structure, it is necessary to have a clear understanding of the term "integration" As used in this article integration means "no work, once begun, should be ended within a prescribed time limit' The work should be carried out continuously and should be correlated with, and integrated into, other closely allied health activities It must occupy an important position in the public health structure of the country, province, city, and/or municipality It should not be a separate undertaking, but should be part of a rounded and well balanced health programme

WHO and UNICEF, in extending aid to the Philippines for the control of yaws, have made a proper approach to the solution of one of the most important public health problems of the country Yaws is an outstanding disease of the tropics, where it is particularly necessary to arouse the enthusiasm of the people and to secure their confidence in public health work Yaws control fulfils in very fair measure the various psychological and scientific requirements essential to the control of a communicable disease The obvious characteristics of the disease and its mode of spread in a community provide a clear and graphic illustration of the need for taking elementary precautions with regard to personal hygiene The experience of having yaws teaches the consequences of neglect and becomes an object lesson not easily forgotten

The integration of the yaws control programme into the health structure of the country has been proposed in order to provide a means by which sustained efforts to control the disease can be made Past and present experience has indicated the need for a continuous, correlated, and integrated plan, such as that followed in the campaign at Parañaque carried out by Dr Lopez Rizal and his associates, if the disease is to be successfully controlled and eradicated

Objectives

The principal aims of the plan are as follows

(1) to provide sustained, correlated, and integrated efforts for the control of yaws ,

(2) to provide a practical means of carrying out special campaigns in the most economical and feasible way ,

(3) to train the local health personnel to solve their own health problems and to cultivate a spirit of self reliance and confidence , and

(4) to provide a means of educating the general public in personal hygiene and community sanitation

Organization

Personnel In the integrated yaws-control programme, the existing personnel of the Bureau of Health in the provinces, cities, and/or municipalities will be utilized The persons who will carry out the work in the provinces and cities are .

(*a*) presidents of sanitary divisions, public-health nurses, and sanitary inspectors, for field work ,

(*b*) district health officers and city health officers, for supervising the activity within their respective territories , and

(*c*) the programme director, for the general administration The programme as a whole shall be the responsibility of the Bureau of Health

Training Before undertaking the work, the personnel shall be given adequate training in spot mapping, census-taking, recognition of cases, blood-drawing, injection techniques, epidemiological investigation, recording, and preparation of reports in accordance with the proposed plan of operation The five teams operating in Leyte and Samar will act as training centres for the health personnel of these two provinces, the trainees being assigned to the teams until they are able to carry on the work by themselves

When all the personnel in these two provinces have completed training, those who will compose the field unit for the province where yaws control is to be undertaken next will be trained with one or another of the teams in Leyte or Samar This group will, in turn, serve as the nucleus for training the rest of the personnel of that province, following the same pattern of in-service training Surigao, because of its proximity to southern Leyte, was chosen as the first province in the expansion of the programme

Procedure

In carrying out the proposed integrated plan of yaws control, the pattern of work established by the five field teams in Leyte and Samar will be followed

To carry out this programme effectively, a " block system " of yaws control is proposed A block consists of a limited and clearly defined area of any municipality, and is composed of at least 100 houses A spot-map of the block is made indicating all the houses in the block duly numbered The population is then counted, and the number of cases found indicated on the map by some convenient sign Cases are given appointment cards and advised when to report to the clinic for treatment and verification by the president of the sanitary division Since the complete course of treatment consists of two injections of PAM at four days' interval, two days a week are set aside for yaws-control work Once the work is completed in the first block, the same procedure is followed in adjacent blocks until the whole of the community is covered The allocation of two

days a week for yaws control under the block system is made in ord not to disturb the regular activities of the local health organization may seem that the immediate result of the plan cannot be appraised quickl however, the system will provide for sustained efforts and continuity work, which are essential to the successful control of yaws Intermitte or periodic operation of yaws clinics is not a satisfactory procedur especially in heavily infected places

As a result of the closer contact with the people afforded to the healt workers, the block system will provide every opportunity for developin the health consciousness of the general public, for offering them wid service, and for securing their co operation and making them anxious t follow any practical suggestion for improving their health habits Thu practised, the block system will pave the way for the integration of yaw control into the permanent health structure of the community

The municipality of Calubian in Leyte, with a population of 20,559, wa selected as a demonstration area to illustrate the operation of the bloc system The health personnel of this municipality consists of a physicia —the president of the sanitary division—and a sanitary inspector I accordance with the joint agreement of 28 August 1951 between the Execu tive Officer of the Bureau of Health, the District Health Officers of Leyt and Samar, and the Programme Director, the physician was sent for trainin with the field team in Biliran, Leyte On completing his training h applied the system in Calubian By all indications, the experiment seeme practicable and effective

Difficulties

Programme proposals are often accompanied by difficulties which should be explored at the very beginning All means of securing the successful execution of the plan should be studied and possible draw backs provided against One of the most important problems, which should be given proper attention, is that of personnel Their training attitude, and background will have a decisive influence on the success of the plan If they are given every encouragement and guidance and are made to feel that they have a mission to accomplish, they will measure up to what is expected of them In addition, they have the backing of a well disciplined public health organization to which they owe devotion and loyalty The question of funds is also a difficult problem, but it is believed that civil authorities will find means to provide the necessary amount for any worthy undertaking

Outlook for the plan

Immediately before the outbreak of the second World War, yaws clinics under the Bureau of Health were held once a week by the personnel

in the endemic areas of Luzon, Visayas, and Mindanao They were required to submit reports on the number of cases treated, the types of lesions, dosage, and follow up The classification of lesions at that time did not conform to the currently accepted nomenclature of yaws, a situation that will result in some confusion The proposed integration of yaws control into the permanent health structure of the country may seem to be a continuation of the yaws clinics previously conducted by the Bureau of Health The proposal, however, requires that the campaign, although it is to be undertaken by the local health personnel, shall be conducted according to a definite pattern, the ultimate goal being the complete eradication of yaws

High hopes are entertained for the development of an integrated programme of yaws control, since the field personnel of the Bureau of Health will have been fully trained to conduct yaws clinics With the proposed in service training, compliance with additional requirements as specified earlier, should not be difficult Thus integrated the yaws campaign will be continuous and will entail no additional expense since the services of the present health personnel will be utilized, it will however require additional effort on their part

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The heads of the yaws control teams the public health nurses and the sanitary inspectors for their practical and efficient execution of the points mentioned in this paper

SUMMARY

The presence of yaws was reported in the Ph l ppines as early as 1907 and salvarsan was used in its treatment in 1910 In 1921 a field experiment in yaws control was ---ned out a house-to-house survey was de in Parañaque Rizal Province and 08 persons were examined of whom 1% had yaws In 1923 the Bureau of ealth extended this campaign to other reas between that year and 1929 a total of 107 478 persons were treated A further 31 647 cases were treated in 1938 After the second World War a number of temporary yaws treatment units were established in the more heavily infected pro-

RÉSUMÉ

La présence du p an a été s gnalée dans les Phil ppines dès 1907 et le salvarsan y a été utilisé dès 1910 Une expérience de lutte contre cette maladie a eu lieu en 1921 on a procédé à une enquête maison par maison à Parañaque (Province de Rizal) et on a examiné 9 308 personnes dont 2,1% se sont révélées *infectées* En 1923 la D rection de la Santé publ que a étendu cette campagne à d autres régions. Entre lad te année et 19?9 107 478 personnes ont été traitées En 1938 31 647 autres cas ont été so gnés. Après la Deuxième Guerre mondiale un certain nombre de centres tempora res de tra tement ont été établis

vinces However, yaws is prevalent throughout the country Examinations conducted as part of the treponematoses-control project which has been in operation in the provinces of Leyte and Samar since August 1951, and in which assistance has been given by WHO and UNICEF, have revealed areas where the prevalence is as high as 30%

In order to control yaws successfully, *and ultimately to eradicate it, it is proposed* to integrate the present yaws-control programme into the permanent health structure of the Philippines and to extend it, province by province, to the whole country. This would make it possible not only to make a continuous attack on the disease in an *economical manner*, but also *to* educate the public in personal hygiene and *community sanitation, since the control* of yaws has considerable popular appeal

The general responsibility for the integrated programme will be with the Bureau *of Health, and the work will be carried out* by the regular health personnel, who will consequently be required to make an additional effort They will have to be given suitable training, and, to this end, the five control teams operating in Leyte and Samar will give training to the personnel in these provinces When their training has been completed, a nucleus of health workers from the province to which the campaign is next to be extended will join *these teams for training*, on returning to their province, they will train the remainder of the personnel there This process will be repeated for each province in turn as the programme expands

In order to carry out the programme effectively, a "block system" of control has been proposed A limited area of a municipality, consisting of at least 100 houses, is chosen and mapped, with all the houses numbered The population is then *counted and examined*, and the cases found are indicated on the map. These cases are told when to report to the local clinic for treatment Since the treatment

dans les provinces les plus gravement atteintes Cependant, le pian sévit dans l'ensemble du pays A la suite d'examens *entrepris à l'occasion* d'un projet de lutte contre les tréponematoses, qui a été exécute dans les provinces de Leyte et de Samar à partir d'août 1951 avec l'assistance de l'OMS et du FISE, on s'est aperçu que la frequence de la maladie atteignait 30%

Pour enrayer le pian et parvenir, en fin *de compte, à le supprimer, l'auteur* propose qu'on intègre le programme actuel dans les services permanents de santé des Philippines et qu'on l'étende, province par province, à la totalite du pays On pourrait ainsi non seulement combattre la maladie de façon continue et économique, mais *aussi profiter de l'accueil très favorable* que rencontre la lutte contre le pian pour enseigner à la population des notions d hygiène individuelle et de salubrité publique

La responsabilite genérale de tout le programme incombera à la Direction de la *Santé publique et* le travail d'execution sera confie au personnel regulier des ser- [illegible]

chargeront d'enseigner les agents sanitaires de ces provinces Une fois ceux-ci convenablement prépares à leur tâche, un noyau d'autres agents de la province à *laquelle la campagne s'étendra, par la suite,* [illegible] pour y recevoir

[illegible] chaque province, au fur et à mesure du developpement du programme

Pour des raisons d'efficacite, on a proposé un système de lutte par « ilot » On choisira un secteur bien délimité dans chaque commune et les maisons seront numerotées Chaque ilot devra comprendre au moins 100 maisons La population sera alors denombree et examinée, et les cas depistés seront indiqués sur une carte On informera ces malades de la date à laquelle ils doivent se présenter au dispensaire local

cons sts of two injections of PAM given at four days interval two days a week are to be devoted exclusively to yaws control by the cl n c. When the work is completed in ~e block the same procedure is to be ppl ed in the next until the entire com unity has been covered This system has een tried in one community in Leyte and as been found practicable and effective

pour subir un traitement Comme le traite ment consiste en deux injections de PAM à quatre jours d intervalle le dispen saire consacrera deux jours par semaine à soigner exclusivement les personnes atteintes de pian Lorsque les opérations seront terminées dans un îlot on passera à l ilot suivant jusqu à ce que toute la commune ait été examinée Ce système a été essaye dans une agglomération de Leyte et s est révélé à la fois pratique et eff cace

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YAWS CONTROL — AN OPPORTUNITY FOR PROMOTING RURAL HEALTH-SERVICES

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General Observations

The goal towards which every health worker must strive regardless of the importunities of his daily work, is the raising of the level of health of the people This must be his philosophy, his creed, and his purpose Because the pursuit of more limited objectives tends to restrict the breadth of his vision it becomes necessary to examine a disease control programme not as an end in itself but rather as a means towards something broader.

One of the most effective means for advancing towards better health for everybody is the establishment and maintenance of some form of adequate local health service There is little question as to the desirability of a population's having such services available, as is shown by the remarkable progress made in the prevention of disease and promotion of health in many places where such services exist

A concentration on one disease to the exclusion of others may be compared with the over-extension of a single military salient into the enemy's territory Without the advance of its lateral support, the salient may find itself in difficulty So, too, must a public health spearhead such as a yaws-control programme, proceed only in relation to the supporting elements of public health That it may be a spearhead is our thesis here but it cannot become the whole campaign

One might raise the question whether the overwhelming problems associated with a single disease, such as yaws, should not lead one to concentrate upon its eradication rather than to spend one's substance on a more diffuse effort such as the promotion of general public health Experience has shown that unilateral efforts have often failed in all but

the most transitory objectives So far as we know, there is no record of an extinct disease We must therefore always expect a reservoir of cases even in populations which have been subjected to "eradication" measures It is this small focus which represents the real danger as soon as the pressure of an intensive campaign is reduced Only the constant search for, and suppression of, this residue of cases can properly be said to be a permanent control measure

A disease control team can stay in a locality until the last infectious case has been found and treated, but in practice the law of diminishing returns militates against this Furthermore, it is a public health axiom that no one person is completely safe from the hazards of disease until all are safe The same applies to communities since the control of a disease in one community is no assurance of protection unless neighbouring communities are also under control To protect all communities in an area where a disease is highly prevalent would require more teams of specialists than are likely to be available The campaign must be pursued among the neighbouring communities while the remaining reservoir of infection in the treated community is kept under the surveillance of an adequate local health-department

This is not to advocate the neglect of a serious disease problem until the time is ripe for establishing a modern health-centre with complete equipment and staff in every locality of a country or province It is clear that under certain circumstances a single piece of health work, such as the drainage of a swamp or the application of DDT to dwellings can bring much benefit to the people The warning we wish to sound here is that a particular aspect of health work must not be permitted to be a goal in itself but must be merely a step towards realizing the goal

General health services are desirable, not only from the point of view of the measurable advances which follow their establishment but also because they represent a form of progress which goes hand in hand with other stages of a society's evolution The health factors inherent in economic development are by now well known, and the interrelationship between social and health causes and effects is axiomatic The promotion of general health services as an objective means that the efforts expended have far greater potentialities than those connected with any lesser

The advent of public-health services has generally b of
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A yaws-control campaign is a good method for stimulating general

occurring in rural underdeveloped localities and affecting large numbers of children Since the suffering of children arouses great popular concern and since the incapacity of young adults results in manpower losses, yaws control activities have subjective and objective, social and economic significance In addition the disease tends to be most prevalent in those localities where general health services are insufficient From all indications therefore yaws-control campaigns may serve admirably as forerunners of programmes which are desperately needed Thus, the spearhead meets little resistance

The fact that yaws lesions are generally external makes people more aware that they have the disease in their midst—this visual evidence facilitates public understanding of the problem In this respect moulding public opinion through yaws control has many advantages over projects directed against diseases which are not as patently apparent to persons in rural underdeveloped regions of the world As the personnel working in health programmes are, at least in the early stages " foreigners their function in building sound public health is likely to be better understood if their first task has to do with a disease in which the signs are so clearly evident.

The present day therapeutic agents by which yaws may be conquered almost with a single stroke offer a golden opportunity to demonstrate the value of modern public health and medical services and to gain public support There is hardly any other disease problem which can be so readily attacked and in which the expectations from treatment are so great The development of an effective, non toxic easily given therapeutic agent is the aim in many diseases , we have achieved that aim in the case of yaws If the old admonition to " put your best foot forward may apply in public health then a yaws-control programme, when conceived as a means rather than as an end serves admirably The spearhead brings the rest of the forces close behind it

Planning

It is clear that an important goal for any population group is the establishment and maintenance of adequate general health-services It is likewise obvious that a yaws-control programme provides an opportunity to bring this benefit to a community The problem which faces public health administrators is the reconciliation of these two concepts into an answer to the question " How ? " The key to the attainment of the objective is planning

For example, in the case of a yaws control team beginning a two year programme in a community, it is possible to outline the personnel and equipment needed as follows Among the persons on the team might be a *physician and an auxiliary worker*, both drawn from the local population The latter could be trained so that he could make home visits with special reference to yaws, later expanding his interests to other communicable diseases, and then finally to other health matters In this way the seeds of a public health nursing programme can be sown Similarly, the local *physician attached to the team can attend to general medical problems gradually expanding his scope* On the withdrawal of the team, therefore the nucleus of a local health unit can be left behind to cope with the reservoir of yaws cases and to work towards a modern and more adequate health service All this should be correlated with programmes of education and *training of professional health workers at all levels*

This is but a sketchy illustration of one of the most important processes *in public health work—planning This process of planning should* begin early in any programme After assessing the problem in this case yaws prevalence and establishing the long range goals, namely the provision of adequate local public health services planning should outline the methods whereby the campaign may proceed from the solution of the one to the achievement of the … mate of resources both human and m… each period of the campaign … tions must be calculated as well as the steps necessary to obtain or produce them The anticipated accomplishment of each unit, both human and material, should also form part of such an outline, again with the time factor carefully considered Thus, a step by step building up of a plan would serve as the blueprint for the programme

The responsibility for the general planning in public health must rest with the agency charged with the implementation of the programme and this means the *national or local government The idea that only an* international agency, such as WHO should do the planning is erroneous Its role should largely be limited to providing advisers who can discover and evaluate the facts which have a bearing upon the plans and who can give their technical aid in the actual formulation stage Only the health *authorities of a nation can estimate* (*a*) the human and material resources which will be available from time to time , (*b*) the economic, social reli gious, and other factors which may augur well for a plan or may de it to failure from the start, (*c*) the readiness of the public *for health serv* —of what kind and to what extent Thus one may lay down the that planning should begin early, with the full participation start of the agencies which will implement the plan, and should to indicate what, by whom, when and how much

Among the characteristics of a good plan are the following

(1) A good plan outlines a series of limited objectives consistent with, and leading up to, a stated general purpose, and indicates the gradual course of action

Those who formulate plans for establishing local health services through the inauguration of a yaws-control programme should indicate the subsidiary year to-year goals There is reason to believe that some general medical services should be available from the very beginning of a specific disease-control project Persons working in the field have reported that patients sometimes have difficulty in understanding why their medical or surgical conditions do not come under the jurisdiction of a service unit that the whole community praises for its wonderful work The inclusion of more comprehensive services from the start permits the planner to con de ... he to ...

education and training of personnel must necessarily be determining factors in planning the speed of progress by way of the short term objectives towards the main aim

(2) A good plan should be thoroughly understood at all levels and those who participate in the programme should share in its preparation

Participation in planning may be stimulated through universal agreement on the needs and on the objectives In places where yaws is prevalent, the early co-operation of the health authorities as well as of the community leaders and even of the general population should not be difficult to attain This is the first step in assuring co-operation throughout the subsequent stages of planning and implementation

(3) A good plan is realistic and provides for maximum use of facilities both existing and envisaged

The prevalence of yaws in areas of poor economic resources ... the frugality with which the public-health administrator m... his work He must make the best possible use of his per... entrusting involved technical procedures to partially ... while training them and others to do more, and to do ... for general local health services under such conditions ... well grounded

(4) A good plan is flexible and capable ...

Although the development of e... always be anticipated, a progran... surveillance so that plans may be ... establishment of repository penicillin ... of treponemal diseases, for instance, ... the continuation of existing pr...

which are flexible and capable of revision would be able to adapt the new scientific knowledge into its administrative structure

Expected Results from Well-Planned Campaigns

From the experience gained in mass campaigns against treponemal diseases in general and against yaws in particular, it is already possible to state definitely that, when mass therapy is carefully planned and systematically carried out, the immediate effect is a significant reduction in the number of infectious cases Thus, in a pilot area, the village of Nong Kratom, in Rajburi Province, Thailand, with a population of 2,891, there were 675 cases of yaws, or 23 3% of the total population Treatment was given in a single injection to all cases, but the schedules varied , 300,000 units of PAM were given to children two years old or under, 600,000 units to those between three and ten years of age, and 1,200 000 units to all those over ten

The results one and three months after treatment were as follows

Type of lesion	*After one month*		*After three months*	
	healed (%)	*improved* (%)	*healed* (%)	*improved* (%)
Early infectious	85 2	100	100	100
Open ulcerative	55 5	100	88 8	100
Hyperkeratosis	4 3	64 8	29 4	94 9

At these two follow up examinations, the entire population was re-examined At the first, no new cases were discovered , at the second only two new cases appeared

A similar pattern is apparent in many other projects for treponemal disease control The earliest of the mass-treatment programmes, and the one with the most completely delineated base lines, is the campaign still being conducted against endemic syphilis in Bosnia This disease is communicated non venereally, chiefly among children, in much the same manner as yaws The results of the campaign in Bosnia, the lessons learned and the epidemiological observations, have been summarized by Grin[3]

From this well organized and methodically conducted campaign, it has been reported (in a personal communication from I Pintaric) that, on the average, during the first control examination in an area where a large reservoir of manifest syphilis existed, it was found that the number of cases of secondary syphilis (relapses, reinfections and new cases) was reduced to about 10% of the number discovered at the beginning of the campaign With further systematic control examinations, that number was progressively reduced to a few sporadic cases, or to the point where the disease disappeared completely Complete disappearance of infectious cases was noted in some isolated villages at the first control examination

Discussion

Experiences such as these, repeatedly confirmed in other WHO/UNICEF field programmes, lend support to the contention, put forward elsewhere,[6] that if treponemal-disease-control programmes are carefully planned and meticulously carried out, there is a reasonable prospect that these diseases ultimately can be eliminated as major public-health problems.[5]

One occasionally meets the argument[8] that no communicable disease has ever been eliminated by the sole process of treating infected persons. If such a statement suggests the inference that complete control of yaws is unlikely from the use of limited numbers of stationary clinics, one would, of course, agree, for such has indeed been the experience of the past. Nevertheless, as Harding[3] has clearly demonstrated, when mass treatment is accompanied by active case-finding covering a large proportion of the population, persistent efforts to reduce the level of infectiousness will be well rewarded. In this connexion it is interesting to note that never before has there been available to those carrying out control work against any disease a weapon comparable to repository penicillin in the treatment of yaws.

It is a well-established epidemiological principle[1] that, for the control and eventual elimination of certain communicable diseases, it is necessary only that the incidence of new infections be held consistently below the level at which the number of infectious cases are rendered non-infectious. Therefore, by constantly keeping one step ahead of the spread of *Treponema pertenue*, yaws can ultimately be controlled. A reassuring corollary of this epidemiological fact is that, for certain communicable diseases, when diminishing ratios are obtained over successive periods of time, the rate of declining incidence tends to accelerate as the disease comes under increasingly effective control.

It is well recognized that no single mass sweep through an area will effectively control any of the treponemal diseases. It is believed possible, however, that with repeated mass surveys the incidence of the infectious cases can be reduced to the point where permanent public-health facilities will be able to stamp out residual foci before the disease can spread widely, particularly if active case-finding measures are continued.

There is a real danger in telescoping into a relatively brief period the beneficial results of decades unless at the same time there are plans to consolidate the gains by increasing permanent rural public-health facilities. Lambert[8] cites an example of what happened in one instance in which treatment facilities were prematurely abandoned and active case-finding work was discontinued. As a result of an intensive campaign in Western Samoa during the years 1923-6, in which 25,000 persons out of a total population of 40,000 received treatment with arsenicals and bismuth, infectious yaws was practically eliminated from the island. However,

because of political disturbances the campaign was abandoned, and within four years, cases of early yaws " began to sprout like mushrooms in all directions " [4]

The soundest method of avoiding such a catastrophe is to build into and around the yaws control programme progressively better general rural health services At some point, the yaws control activities carried out with the assistance of international organizations must be integrated into the *permanent rural public health structure of the country* As the need for intensive yaws control activities diminishes, general public health measures of gradually increasing scope should be introduced

In certain districts of Bosnia, where the endemic syphilis control campaign has been carried out with excellent results, the emphasis is being shifted to the next most prevalent condition, ringworm of the scalp Meanwhile, rural health centres are being built as more and more trained personnel to work in them are becoming available The transition must be carefully planned, with the ultimate objective of adequate rural health services suitable to the local situation

With good planning and conscientious implementation at each successive step, the end result will be not only the control of yaws, but health services that are consistent with the broad objective of providing for people in what are now underdeveloped rural areas the highest attainable standard of health, which in the words of the WHO Constitution "is one of the fundamental rights of every human being'

SUMMARY

One of the most effective ways of securing better health for all is to provide adequate local health services

Experience has shown that even when *all efforts are concentrated on eradicating* a single disease a dangerous reservoir of cases always remains The search for and suppression of this reservoir must be carried out by public-health services as part of a permanent control programme Thus a particular aspect of health work must be seen as a means towards an end rather than as an end in itself

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RÉSUMÉ

L une des façons les plus efficaces d ameliorer l état de santé de la population est d organiser des services sanitaires locaux bien conçus

L experience a montré que même en *mobilisant tous les efforts en vue d éliminer une certaine maladie* on laisse toujours subsister un dangereux foyer d infection Il incombe par conséquent aux services de sante publique de s attacher sans relâche *à dépister ce réservoir de morbidité* pu s à le supprimer C est pourquoi il faut vo r dans une activité sanitaire determinée un moyen en vue d une fin plutôt qu'une fin en soi

Les campagnes menées contre le pian dans les regions où sévit cette maladie sont un moyen efficace d accélerer l établissement de services généraux de santé publique Cela pour trois raisons l epi

is cs of the d sease facil tate its control t is relatively easy to diagnose and its treatment expectations are very good Occurring ch efly in rural underdeveloped trop cal areas yaws affects large numbers of children and young adults and thus arouses cons derable popular concern For that reason l ttle res stance is offered to control programmes and publ c op nion may through them, be moulded in favour of fuller publ c heal h services Moreover there has ne er been ava lable for control work aga nst any other disease a weapon comparable to repos tory pen cill n in the treatment of yaws

démiolog e spécif que du p an rend la lutte relativement a sée le d agnost c de la malad e est fac le et son tra tement offre de grandes chances de succès Cette affec t on qu est surtout repandue dans les zones rurales des rég ons trop cales peu évoluées frappe en grand nombre les enfants et les jeunes adultes de telle sorte que la populat on vo t en elle un redoutable fléau C est pourquoi les campagnes contre le p an ne sont pas accue ll es avec défaveur par les hab tants et sont aptes à preparer les espr ts á l extens on des serv ces de santé publ que En outre la pen cill ne retard offre pour le tra tement du p an une arme plus efficace qu aucune de celles dont on a t jama s d sposé contre les autres malad es

The authors cons der how yaws-control programmes may be developed into adequate general health serv ces Taking a two-year programme as an example they suggest that there should be on the control team a phys c an and an aux l ary worker drawn from among the local populat on The phys c an should also at end to *general heal h problems* and the aux l ary worker should be tra ned to make home vis ts deal ng part cula ly w th yaws, and later w th d fferent commun cable d seases and other health problems On the w hdrawal of the team a nucleus would thus rema n to cope w th the reservo r of yaws cases and to work towards modern and adequate health-serv ces

Les auteurs de l art cle exam nent com ment les act vités entreprises contre le p n pourra ent serv r de po nt de d part à l étabI ssement d serv ces complets de santé publ que Env sageant à t tre d exemple un programme b ennal de lutte contre cette malad e ils suggèrent que l équ pe chargee des opérat ons comprenne *un médecin et un aux lia re cho s parmi* la populat on locale Le médec n s occupera t aussi de problèmes san ta res d une portée genérale Quant à l aux l a re après s être b en fam l ar sé avec la lutte contre le p an pu s contre differen es autres mala d es transm ss bles au moyen de v s tes à dom c le il sera t amené à étendre son act on à d autres secteurs L equ pe une fois partie un noyau demeurera t sur place pour s attaquer aux cas de p an qui sub s steraient encore et pour travailler à la créat on de serv ces de santé publ que modernes et ad quats

They next d scuss the problem of plan n ng the respons b l ty for wh ch must rest w th the local or na onal go ernment and g e the four ma n character s cs of a good plan it should ou l ne a ser es of l m ted object ves con s ent w th and lead ng to a stated general purpose t should be understood at all le el and all who part cipate in the program me should share in its preparation t should pro de for a max mum use of fac l es and t should be flex ble and capable of revis on

Le so n d etabl r un programme d act on et de ve ller à son exécut on incombe aux autor tés locales ou au gouvernement central Pour qu un plan d opérat ons so t efficace il est essent el 1) qu l fixe une sér e d object fs l mités s sant un but géne al la rement défin 2) qu l so t b en con a tous les échelons et que tous ceux qu part ipent à son exécut on a ent abo e a sa mise sur p ed 3) qu l soit conçu de façon à permettre le me lleur emp o pos ble des moyens mis en œu re 4 qu l a une certaine souplesse et pu sse être mod f e ou adap é

because of political disturbances the campaign was abandoned, and within four years, cases of early yaws "began to sprout like mushrooms in all directions" [4]

The soundest method of avoiding such a catastrophe is to build into and around the yaws control programme progressively better general rural health services. At some point, the yaws control activities carried out with the assistance of international organizations must be integrated into the permanent rural public health structure of the country. As the need for intensive yaws control activities diminishes, general public health measures of gradually increasing scope should be introduced.

In certain districts of Bosnia where the endemic syphilis control campaign has been carried out with excellent results, the emphasis is being shifted to the next most prevalent condition, ringworm of the scalp. Meanwhile, rural health centres are being built as more and more trained personnel to work in them are becoming available. The transition must be carefully planned with the ultimate objective of adequate rural health services suitable to the local situation.

With good planning and conscientious implementation at each successive step, the end result will be not only the control of yaws but health services that are consistent with the broad objective of providing for people in what are now underdeveloped rural areas the highest attainable standard of health which in the words of the WHO Constitution "is one of the fundamental rights of every human being."

SUMMARY

One of the most effective ways of securing better health for all is to provide adequate local health services.

Experience has shown that even when all efforts are concentrated on eradicating a single disease a dangerous reservoir of cases always remains. The search for and suppression of this reservoir must be carried out by public health services as part of a permanent control programme. Thus a particular aspect of health work must be seen as a means towards an end rather than as an end in itself.

In areas where yaws is prevalent control campaigns against this disease are a good means of stimulating the development of general public health services for three reasons the epidemiological character

RÉSUMÉ

L'une des façons les plus efficaces d'améliorer l'état de santé de la population est d'organiser des services sanitaires locaux bien conçus.

L'expérience a montré que même en mobilisant tous les efforts en vue d'éliminer une certaine maladie on laisse toujours subsister un dangereux foyer d'infection. Il incombe par conséquent aux *services de* santé publique de s'attacher sans relâche à dépister ce reservoir de morbidité puis à le supprimer. C'est pourquoi il faut voir dans une activité sanitaire déterminée un moyen en vue d'une fin plutôt qu'une fin en soi.

Les campagnes menées contre le pian dans *les régions où sévit* cette maladie sont un moyen efficace d'accélérer l'établissement de services généraux de santé publique. Cela pour trois raisons l'épi

ecs of the disease facilitate its control, it is relatively easy to diagnose, and its treatment expectations are very good. Occurring chiefly in rural, underdeveloped, tropical areas, yaws affects large numbers of children and young adults and thus arouses considerable popular concern. For that reason little resistance is offered to control programmes and public opinion may through them be moulded in favour of fuller public-health services. Moreover, there has never been available for control work against any other disease a weapon comparable to repository penicillin in the treatment of yaws.

The authors consider how yaws-control programmes may be developed into adequate general health services. Taking a two year programme as an example they suggest that there should be on the control team a physician and an auxiliary worker drawn from among the local population. The physician should also attend to general health problems and the auxiliary worker should be trained to make home visits dealing particularly with yaws and later with different communicable diseases and other health problems. On the withdrawal of the team a nucleus would thus remain to cope with the reservoir of yaws cases and to work towards modern and adequate health services.

They next discuss the problem of planning the responsibility for which must rest with the local or national government, and give the four main characteristics of a good plan: it should outline a series of limited objectives consistent with and leading to a stated general purpose; it should be understood at all levels and all who participate in the programme should share in its preparation; it should provide for a maximum use of facilities; and it should be flexible and capable of revision.

demiologie spécifique du pian rend la lutte relativement aisée, le diagnostic de la maladie est facile et son traitement offre de grandes chances de succès. Cette affection, qui est surtout répandue dans les zones rurales des régions tropicales peu évoluées, frappe en grand nombre les enfants et les jeunes adultes de telle sorte que la population voit en elle un redoutable fléau. C'est pourquoi les campagnes contre le pian ne sont pas accueillies avec défaveur par les habitants et sont aptes à préparer les esprits à l'extension des services de santé publique. En outre, la pénicilline retard offre pour le traitement du pian une arme plus efficace qu'aucune de celles dont on ait jamais disposé contre les autres maladies.

Les auteurs de l'article examinent comment les activités entreprises contre le pian pourraient servir de point de départ à l'établissement de services complets de santé publique. Envisageant à titre d'exemple un programme biennal de lutte contre cette maladie, ils suggèrent que l'équipe chargée des opérations comprenne

[illegible] à étendre son action à d'autres secteurs. L'équipe une fois partie, un noyau demeurerait sur place pour s'attaquer aux cas de pian qui subsisteraient encore et pour travailler à la création de services de santé publique modernes et adéquats.

Le soin d'établir un programme d'action et de veiller à son exécution incombe aux autorités locales ou au gouvernement central. Pour qu'un plan d'opérations soit efficace, il est essentiel: 1) qu'il fixe une série d'objectifs limités visant un but général clairement défini; 2) qu'il soit bien compris à tous les échelons et que tous ceux qui participent à son exécution aient collaboré à sa mise sur pied; 3) qu'il soit conçu de façon à permettre le meilleur emploi possible des moyens mis en œuvre; 4) qu'il ait une certaine souplesse et puisse être modifié ou adapté.

From the experience gained in mass campaigns against various treponemal diseases, the authors find that, when mass therapy is carefully planned and systematically carried out, a significant reduction in the number of infectious cases results In one control area in Thailand for instance, all early infectious cases of yaws were healed three months after treatment In Bosnia, where a campaign is being waged against endemic syphilis, it was found at the first follow up examinations that the number of cases of infectious syphilis was reduced to about 10% of the original number In certain isolated villages, infectious cases had completely disappeared Thus, it seems that, with repeated mass surveys the incidence of infectious cases of treponemal diseases can be reduced to the point where permanent public health facilities will be able to stamp out the residual foci

However, there is very considerable danger in abandoning treatment facilities and case finding prematurely In Western Samoa, for instance, infectious yaws had almost been eliminated in 1926 when an intensive campaign had to be abandoned, within four years cases of early yaws reappeared in large numbers At some point, the yaws-control activities must be integrated into the permanent rural public-health structure of the country As the need for intensive control of yaws decreases, general public health measures of gradually increasing scope must be introduced

On a constaté que, si elles sont organisées avec soin et menées méthodiquement, les campagnes de grande envergure contre les diverses tréponématoses permettent de réduire sensiblement le nombre des cas infectieux C'est ainsi que, dans une région de la Thaïlande, tous les sujets atteints de pian infectieux récent ont été guéris après trois mois de traitement En Bosnie, où une campagne contre la syphilis endémique est actuellement en cours, les premiers examens post thérapeutiques ont fait apparaître que le nombre des cas de syphilis infectieuse avait été ramené à environ 10% du chiffre initial, et même à un chiffre voisin de zéro dans certains villages isolés Il semble donc que, en recourant à une série de vastes enquêtes, on parviendra à ramener la fréquence des cas infectieux de tréponématoses à un niveau suffisamment bas pour que les services permanents de santé publique réussissent à éteindre les foyers qui pourraient subsister

Il serait cependant imprudent d interrompre prématurément les campagnes de traitement et de dépistage Le cas du Samoa occidental est significatif à cet égard Grâce à une campagne intensive le pian infectieux avait été presque totalemen éliminé de cette région en 1926, époque à laquelle il fallut interrompre les opérations quatre années plus tard, on assistait à une forte recrudescence de pian récent Il faut que l'action entreprise contre le pian fasse d'une manière ou d une autre partie intégrante des services permanents de santé publique en milieu rural Et au fur et à mesure que la nécessité d une lutte intensive contre cette maladie se fait moins impérieuse il importe d introduire graduellement dans divers domaines les mesures permettant d améliorer la santé publique

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DISCUSSION : PART VII

Chairman Dr D UNGAR
Rapporteur Dr N K. JUNGALWALLA

It is a well-established fact that unless the gains made by mass therapy can be consolidated they will rapidly be vitiated In the past, yaws-control campaigns have failed many times because control efforts have not been continued and made an integral part of the public-health activities of the area Several of the Symposium participants stressed this point, which was illustrated by Dr K R Hill with the data contained in fig 1 These data, which cover 12 000 persons examined, were supplied to Dr Hill by Dr P Murray, of Jamaica

It is obvious that no single mass sweep through an area will eliminate yaws Resurveys of the population must be carried out repeatedly until the incidence of the disease is so low that the few remaining relapses or cases resulting from reintroduction of the disease can readily be handled by the permanent clinic facilities

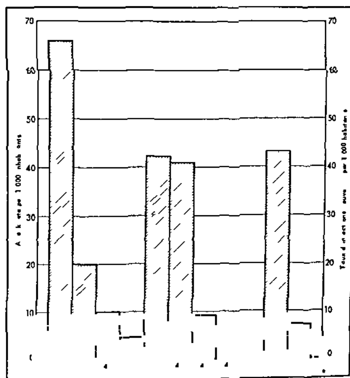
It was considered that, for the programmes in various countries—such as those in Haiti and the Jakarta area of Indonesia—the optimum interval to be planned for between the original mass treatment and the resurvey was three months Several speakers pointed out that plans should take into consideration such factors as the incubation period of yaws, the mode of approach of the mass campaign (for example, whether clinical cases and contacts or all the population were treated), the prevalence of yaws discovered in the community, the season of the year, the drug used and, finally, the permanent facilities available for treatment, either in health centres or by itinerant attendants The general trend of the discussion suggested that the optimal time was not known, but that resurveys should not be delayed for more than one year There is evidence suggesting that the incubation period for yaws is about four to six weeks, and, where mass campaigns have not achieved a maximum coverage, resurveys at intervals of three or six months are desirable

In the discussion on steps for the consolidation of gains during the mass campaign, several speakers emphasized the necessity for consideration of factors other than the treatment of patients alone especially the necessity for a properly organized health service in the rural areas Considerable doubt was expressed whether the use of further teams going round the areas covered by the mass-campaign teams and resurveying and reinjecting

people would suffice Among other points raised was whether such a campaign should be carried out prior to the establishment of rural health services and the value of a treponematosis-control project as a means of introducing modern health services to rural populations It was pointed out that a treponematosis control programme was at the periphery of the health service structure

FIG 1 INCIDENCE OF YAWS IN HARKERS HALL AREA ST CATHERINE JAMAICA

FRÉQUENCE DU PIAN DANS LA RÉGION DE HARKERS HALL SAINTE CATHERINE JAMAIQUE



* No data are available for the years 1949–50
** Mass treatment was carried out during the years 1942–5 1947 and 1951–2

* On ne dispose d aucune donnée pour les années 1949 et 1950
** Le traitement systématique a été effectué durant les années 1942 5 1947 et 1951 2

DISCUSSION : PARTIE VII

Président Dr D UNGAR
Rapporteur Dr N K. JUNGALWALLA

Il est hors de doute que les résultats favorables de la lutte contre le pian par le traitement systématique ne seront guère durables s'ils ne sont étayés et consolidés A maintes reprises, dans le passé, des campagnes antipianiques ont échoué, les efforts faits pour enrayer la maladie ayant été interrompus ou n'ayant pas été intégrés dans les activités de santé publique de la région Plusieurs des participants au Symposium ont souligné ce fait, qu'illustra le Dr K R Hill d'après les données reproduites dans la figure 1 (p 366) Ces renseignements, recueillis au cours de l'examen de 12 000 personnes, ont été transmis au Dr Hill, par le Dr P Murray, de la Jamaïque

Il est évident que le pian ne sera pas supprimé d'un seul coup dans une

Combien de temps après le traitement faut-il effectuer l'enquête de

traitement des cas cliniques et des contacts ou bien de tous les habitants), fréquence de la maladie saison forme sous laquelle le médicament est employé, existence d'installations permanentes, qu'elles soient dans des centres sanitaires ou puissent être desservies par du personnel itinérant De la discussion se dégagea l'idée que l'intervalle optimum restait à déterminer mais que l'intervalle maximum était d'une année environ Il semble

particulier, devient une nécessité Car de l'avis général, il est peu probable que de nouvelles [illegible] p[illegible]urant les régions visitées au cours de la

campagne systématique examinant et traitant a nouveau les habitants, suffiraient a la tâche Cette question en provoqua d'autres une campagne antipianique doit elle preceder l'organisation de services sanitaires? Dans quelle mesure un programme de lutte contre les treponématoses peut il stimuler *la création de services de sante parmi* les *populations rurales ? On a releve* qu'un programme antipianique est subordonné à des services plus généraux

Part VIII

ROLE OF INTERNATIONAL ORGANIZATIONS

Partie VIII

RÔLE DES ORGANISATIONS INTERNATIONALES

THE ROLE OF THE WORLD HEALTH ORGANIZATION IN YAWS CONTROL *

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It is probable that, in the future, the year 1950 will be remembered as a turning point in the great evolutionary movements that have permanently affected the health and welfare of mankind

The decade immediately preceding 1950 gave the medical profession an impressive array of new weapons—antihistaminics, radio-active isotopes, new insecticides, and a whole series of antibiotics Some of these new weapons owe their prestige to their life saving qualities, while others have attained distinction because of the large numbers of people on whom they confer a more modest benefit Simultaneously with the development of more effective remedies, there was being developed the means whereby the benefits of modern medicine could—through international co-operation—be brought to the people most in need of them In 1950 came the merger of these two important forces, for it was in that year that modern therapeutic methods first began to be applied on a mass scale through international co operation

This is not to suggest that international co-operation in the field of health began with WHO for recognition of the international aspects of public health can be traced back as far as the 14th century Many other international health organizations have fostered international co-operation and international help What is new however is a significant change in emphasis and objectives [1] International co operation began with the setting up of quarantine regulations to prevent the spread of communicable diseases from one country to another Today the objective is the control,

* This article will also appear in Spanish, in the *Boletin de la Oficina Sanitaria Panamericana.*

and eventual elimination, of these diseases wherever they occur From dissemination of information on pestilential diseases, we have progressed to pooling of knowledge, experience, and resources to provide direct assistance to countries in promoting the health of their people

The techniques for administering such services to governments are still in the formative stage of development and are still imperfectly understood It was inevitable that mistakes should be made, but it was also inevitable that we should learn and profit from them This is true of yaws control as it is of many other subjects

WHO has been particularly interested in yaws because it is a major public health problem in many tropical countries of the world,[3] and because there has recently been developed a new and effective tool with which to combat it In repository penicillin we have a form of therapy of both high therapeutic efficacy and negligible toxicity that can be conveniently administered in simplified schedules of treatment to the masses of the people in almost any part of the world Because of the enormous number of persons who have benefited and who will benefit from penicillin, this antibiotic must take its place among the most significant advances of the pharmaceutically fabulous forties

The discovery of any new therapeutic agent is generally followed by an orderly sequence of investigations designed to determine the precise scope of its usefulness These include pilot in vitro and in vivo studies to determine the mode of action, the toxicity, and the optimal time dose relationships of administration Subsequently, clinical trials are carried out and the results evaluated by the application of statistical principles If the new therapeutic agent is shown to be useful and free from noxious by effects, a logical next step is consideration by the health administrator of the potential value of the agent in mass application Rarely has such a pattern unfolded as impressively as has been the case with repository penicillin in the treatment of treponemal diseases

One occasionally hears the objection that, since no disease has ever been treated out of existence, global control of yaws is unlikely to result solely from the treatment of infected persons[7] It is true that no disease has so far been eliminated by treatment, but it is equally true that never before have the prospects of doing precisely this been as hopeful as they are today

There is good reason to believe[12 13 14] that, if mass penicillin treatment is carefully planned and systematically carried out, the immediate result will be a significant reduction in the prevalence of infectious cases At that stage, with energetic action to consolidate these gains, by thorough case-finding methods, and by preventing reintroduction of the disease, one

... to a minimum Fortunately for the well

the world, many optimistic

WHO Expert Committee

on Venereal Infections and Treponematoses,[11] have considered it well worth while to explore this new and potentially decisive approach to treponemal-disease control

With a view to giving as wide an application as possible to the knowledge currently available on the diagnosis, treatment, and public-health aspects of treponemal-disease control, WHO has embarked on a broad programme in support of national health administrations that have requested assistance in the initiation and development of treponemal disease-control programmes The nature of these programmes ranges from granting fellowships to establishing teaching and training centres from small community demonstrations to large scale case finding and mass treatment programmes In these projects, which have been in operation for less than two years, with substantial help from the United Nations Children's Emergency Fund (UNICEF) in providing equipment and supplies, more than four million people have been examined, and well over one million cases of treponemal disease (syphilis yaws and bejel) have been treated with simplified schedules involving the use of repository penicillin The following tabulation shows the number of persons examined and treated up to November 1951 in five of the larger WHO supported programmes

Programme	Number examined	Number treated	Percentage
Haiti (yaws)	—	740 829	—
Indonesia (yaws)	1 112 236	226 170	20 3
Iraq (bejel)	18 000	6 000	33 3
Thailand (yaws)	459 688	80 968	17 6
Yugoslavia (endemic syphilis)	941,563	91 988	9 8

Only time will tell whether yaws control can be permanently effected by mass treatment Much will depend upon how successful governments are in consolidating the gains and integrating the work into the permanent public health structure of their countries

In a recent article by Reynolds, Guthe & Samamé [9] a five phase approach to yaws control was outlined as follows (a) orientation and preliminary analysis of the problem, (b) development of methods (c) demonstration, survey, and training, (d) expansion, and (e) consolidation The present symposium was developed along these general lines It may be useful to discuss briefly the role of WHO during each of these five phases

(a) In the *preliminary analysis of the yaws problem in a given area* WHO must depend to a considerable extent on information made available by the local health-authorities It is important to know not only how widespread the yaws problem is, but also how important it is in comparison with the other problems of the area In analysing the importance of yaws

as compared with other public-health problems, due recognition must be given to the fact that only certain of those problems are currently amenable to direct action on the international level

(*b*) In the development of methods, WHO has an important advisory responsibility, since techniques that prove to be useful in one yaws-control programme may often be applied to others, usually with slight modifications to meet the local situation

In yaws control work, the methods required are primarily those designed to overcome difficulties in case finding Yaws being a disease of rural populations in areas where transport and communications are difficult, case finding is an arduous but very essential consideration WHO is constantly analysing the effectiveness of its field programmes with a view to finding the weak spots and the means for improvement

The search for new and improved techniques, designed to utilize international assistance with maximum effectiveness, is a continuing one As one example of this phase of WHO's role in yaws control, one may mention the combined yaws and malaria project that was planned to begin in Liberia towards the end of 1952 There are reasons to believe that this combined approach will prove to be a useful one yaws and malaria frequently coexist, and in the control of both diseases a house to house approach is desirable Moreover, there are indications[6, 10] that insects may play a part in the spread of yaws and some evidence that effective insect-control contributes to reducing the spread of yaws

(*c*) It is during the demonstration, survey, and training phase that WHO can be most useful to governments that desire to bring yaws under better control The Organization ordinarily sends a team of experienced internationally recruited specialists a clinician with administrative experience in organizing and conducting training courses and capable of demonstrating in limited areas how effective yaws control activities can be carried out under local conditions, a serologist to develop the serodiagnostic aspects of the work and a public-health nurse to assist with the training of subprofessional personnel and to oversee certain of the epidemiological phases of the project Of course, the type of assistance needed may, and will be discussed with the government concerned

In general, the international together with the national health workers provide the basis upon which yaws control can be expanded into a mass treatment campaign by delimiting the areas to be covered, by working out appropriate techniques, and by training those who will carry out the expanded programme

(*d*) During the mass treatment campaign, the WHO personnel continue to assist in the programme's expansion in the most suitable manner Moreover, they should carry out control studies in pilot areas to determine the long term efficacy of the project The need for supervising the work of

the treatment units is primarily a responsibility of the government, but one which the international team should share

(e) Consolidation of the results of mass treatment is of necessity a government responsibility, although here again WHO may be called upon for assistance

WHO can help in the control of yaws in these ways At no time, however, do the contributions of the Organization exceed those of the country concerned WHO can stimulate, it can assist, it can support but there can be no substitute for active work by governments, both national and local towards the solution of their own health problems

SUMMARY

Modern therapeutic methods first began to be applied on a mass scale through international co-operation in 1950 International co-operation in health work is in itself not new, however, what is new is the objective of controlling and eventually eliminating communicable diseases wherever they occur rather than restricting their spread across frontiers by quarantine regulations

WHO is particularly interested in yaws because it is a major public health problem in many countries and because there exists in repository penicillin a simple weapon of high therapeutic efficacy and negligible toxicity with which to combat the disease

While it is true that no disease has as yet been entirely eliminated by treatment, never have the prospects of so doing been as good as they are today in the case of yaws It is believed that mass penicillin treatment, if carefully planned and carried out, will result in a significant reduction in the incidence of infectious cases, which can then be kept to a minimum by thorough case finding and preventive measures

WHO has embarked on a broad programme in support of national health

RÉSUMÉ

En 1950, les méthodes thérapeutiques modernes ont été pour la première fois appliquées en grand dans le cadre de la collaboration internationale La collaboration internationale dans le domaine de la santé n est pas chose nouvelle en soi, ce qui est nouveau c est le souci de combattre et d éliminer peu à peu les maladies transmissibles où qu elles sévissent, plutôt que d enrayer leur propagation à travers les frontières au moyen de règlements quarantenaires

L OMS s intéresse spécialement à la lutte contre le pian car d une part cette maladie soulève un sérieux problème de santé publique dans de nombreux pays et, d autre part, la pénicilline retard offre pour le combattre un moyen simple très efficace dont la toxicité est négligeable

S il est vrai qu il n a jamais encore été possible d éliminer complètement une maladie par des moyens thérapeutiques il est non moins exact que les perspectives d aboutir à ce résultat dans le cas du pian n ont jamais été aussi favorables que de nos jours On pense qu un traitement systématique à la pénicilline étudié et conduit avec soin, permettra de réduire considérablement la fréquence des cas infectieux et de maintenir leur nombre à un niveau minimum grâce à des mesures méthodiques de prophylaxie et de dépistage

L OMS a entrepris une large action en faveur des administrations sanitaires na

administrations that have requested assistance in developing treponemal disease-control programmes In less than two years, more than four million people have been examined and well over one million cases of treponemal disease have been treated with repository penicillin

The authors discuss a five-phase approach to yaws control, outlined as follows (*a*) orientation and preliminary analysis of the problem, (*b*) development of methods, (*c*) demonstration, survey and training, (*d*) expansion, and (*e*) consolidation

In the first phase, it is necessary to know how widespread yaws is in an area and how important it is in comparison with other public health problems

In the second phase, WHO has an *important advisory responsibility since* techniques that are useful in yaws control may be applied, with slight modifications, to other diseases It is in the third phase, however, that WHO can be most useful to governments Together with national health workers, the international staff delimit the areas to be covered, work out appropriate techniques, and train those who will carry out the expanded programme *In the expansion phase*, WHO personnel should carry out control studies in pilot areas and share in supervising the work of treatment units WHO may also assist governments in the consolidation phase

In conclusion, the authors stress that at no time does the contribution of WHO exceed that of the government Governments, although perhaps stimulated and assisted by WHO, are ultimately responsible for the solution of their own health problems

tionales qui lui ont demandé son aide *pour la mise sur pied de programmes de* lutte contre les tréponématoses En moins de deux ans, plus de quatre millions de personnes ont été examinées et plus d'un million de cas traités à la pénicilline-retard.

Les auteurs exposent un programme de lutte contre le pian qui comporterait cinq étapes principales *a*) position et analyse du problème, *b*) mise au point *des méthodes*, *c*) *démonstrations, en*quetes et formation du personnel necessaire, *d*) élargissement des opérations *e*) consolidation des resultats acquis

Au cours de la première étape, il est capital de déterminer la fréquence du pian dans une région donnée et de préciser son importance par rapport aux autres problèmes de santé publique

Au cours de la deuxième etape, l OMS a *un important rôle consultatif à jouer*, puisque les techniques qui permettent de lutter efficacement contre le pian peuvent être appliquées, avec de légères modifications, à d'autres maladies C est toutefois lors de la troisième phase que l OMS peut apporter l'aide la plus utile aux gouvernements En collaboration avec les agents sanitaires des pays intéressés, le personnel international délimite les zones d'opération, met au point des methodes bien conçues et forme le personnel qui sera chargé d'exécuter le programme élargi Dans la phase d'extension des opérations, le personnel de l OMS doit procéder à des études de contrôle dans des zones d expérimentation et collaborer à *la surveillance des travaux des equipes* de traitement L'OMS peut egalement aider les gouvernements lors de la phase de consolidation

Les auteurs de l article soulignent, enfin, que la contribution de l OMS ne dépasse jamais celle du gouvernement C est en fin de compte aux gouvernements eux mêmes, parfois stimulés et aidés par l OMS, qu il appartient de résoudre les problèmes sanitaires qui se posent sur les territoires qu'ils administrent

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THE ROLE OF THE UNITED NATIONS INTERNATIONAL CHILDREN'S EMERGENCY FUND IN YAWS CONTROL

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The reasons why UNICEF is interested in the control of yaws are that the disease affects millions of children and that it can be readily cured or arrested UNICEF's policy, as part of its basic concern with maternal and child welfare, is to concentrate its assistance on a few diseases which are widespread, which require imported supplies and equipment beyond the present means of local governments, and which promise to yield to mass treatment at relatively low cost

UNICEF's interest in yaws was not prominent nor even present in its early days When, in 1947, UNICEF took over certain responsibilities for child care from the United Nations Relief and Rehabilitation Administration (UNRRA), the General Assembly of the United Nations in Resolution 57 (I)[1] establishing UNICEF, laid down certain priorities

It was to be "utilized and administered

(a) For the benefit of children and adolescents of countries which were victims of aggression and in order to assist in their rehabilitation

(b) For the benefit of children and adolescents of countries at present receiving assistance from the United Nations Relief and Rehabilitation Administration

(c) For child health purposes generally, giving high priority to the children of countries victims of aggression"

In 1947 UNICEF was left with a multitude of unfinished tasks in Europe where UNRRA had spent money for children on a much larger scale than UNICEF could hope to Everyone knew, in theory, that the needs of Asia were great, but so were the pressures to keep on helping Europe Every proposed reduction in European programmes was fought vigorously on the ground of the priorities established by the General Assembly Also, as the Executive Board of UNICEF was constituted in those days, there were few spokesmen for Asia

[1] United Nations, General Assembly (1947) *Resolutions adopted by the General Assembly during the second part of its first session from 23 October to 15 December 1946* Lake Success N Y., page 91

contributors (about 90% has come from governments) Such contributions are not spontaneous Ministries of external affairs, and members of parliaments, or their equivalents, must be convinced that the money is urgently needed, that it cannot be raised elsewhere, and that it will not be used for the same purposes as those for which other money has already been voted It is true that UNICEF has a special appeal in that it is raising money for children But that does not cancel the necessity for evidence that UNICEF meets obvious and urgent needs, that it tackles problems in a practical fashion that it gets at least a dollar's worth for every dollar spent and that the recipient governments show that their intentions are serious by matching UNICEF's contribution at least dollar for dollar Even when national leaders have been convinced, it still takes many months for the money actually to be appropriated, and sometimes still more months before a cheque is received

Even when UNICEF has the money there is no assurance that it will be allotted to the Asia region, since other areas also have clamorous needs Once the money has been allocated to Asia, yaws-control programmes must still compete with other projects from other countries that have no yaws but still want money Nevertheless, these hazards have been overcome, and enough money has been found to provide the supplies when they were needed

UNICEF expenditure in Asia has been small by standards of other international expenditure Of $160,000,000 allocated by UNICEF in the last five years, including requests now under consideration to date only 10% has gone to Asia (excluding China, Japan, and Korea) The percentage, however, is growing, in current budgets the figure is 25% Of the $16 000 000 dollars already allocated, $1 610 000 have been assigned to yaws control Requests under consideration include an additional $638 000 bringing the total to $2,248,000 Further requests may be made as funds are needed It will be recalled that the United Nations has extended UNICEF's life only until the end of 1953, and that any further plans will depend upon the action of the United Nations in that year Since funds are allocated for several years ahead however, it can be reasonably assumed that UNICEF will continue to support yaws-control programmes at least until the end of 1955

Programme Problems

Every credit belongs to the governments for their perseverance in overcoming obstacles to the initiation of yaws-control programmes I shall illustrate by the case of Indonesia, which had the most difficult problem of all

(1) At the beginning of the programme, the present government had not been organized there were still two governments Working contacts

Except for a small start in China, continuing some phases of UNRRA's work, the beginnings of active interest by UNICEF in the children of Asia began with the visit of Drs Parran and Lakshmanan early in 1948[1] Their report recommended three million dollars for a variety of projects, mostly medical, in south east Asia The discussion of that report brought to a head such issues as when UNICEF assistance in Europe should end, why the postwar emergencies of Asia could not receive similar attention, and whether the third clause in the charter, " For child health purposes generally ", should not be invoked In these discussions the fact was, of course, emphasized that Asia, South America, and Africa have infant mortality rates more than double those of many of the countries helped in Europe Meanwhile, there was also developing in UNICEF a policy of longer term aid, with less emphasis on food and clothing, on which most of the money in Europe had been spent The Parran-Lakshmanan report stressed the desirability of medical aid rather than food for south east Asia, not because food was not needed, but because the problem was too vast for UNICEF to undertake, and because there were other agencies responsible for food Even for assistance in medical programmes, the question was raised whether the time, effort, and money required to lay the foundation were worth the spending by an emergency organization, whose life might be ended abruptly, as UNRRA's had been

Co-operation with WHO

The Executive Board of UNICEF, however, did authorize a beginning, then, with the development of WHO, a workable formula was gradually found WHO was authorized to co ordinate health programmes throughout the world It was not authorized, and not financed, to furnish supplies on a large scale UNICEF, on the other hand, was primarily a supply organization Thus began a partnership which has grown in the last three years from nothing to a sizeable chain of about one hundred projects in the Asian area alone, in which the two organizations together help governments that want help and that are prepared to revise their health programmes to use the findings of modern medical science to fight old diseases in new ways

Financing and Expenditure

Since one of the essentials for controlling yaws on a mass scale is a considerable sum of money for penicillin, transport, and equipment, it should be remembered that several years of work must be done by UNICEF before a vial of penicillin or a jeep arrives in the country where it is to be used The money must first be obtained from governments, or from private

[1] Unpublished document E/ICEF/72 1 July 1948

working under conditions of real hardship The greatest credit of all for the work that has been done belongs to these men in the field

The story of Thailand is essentially the same The financial position of the Government has been better, and the conditions of the workers have gradually improved, with the grant of double per-diem allowances and recently, an increase in pay At the worst, however, the field conditions under which they work match the most adverse conditions in Indonesia

In comparison with the difficulties faced by governments those faced by the international organizations have been small WHO s chief difficulty has been to find the specialized personnel for the international teams and to keep them long enough to give continuity to the advisory services UNICEF has had considerable difficulty in buying equipment in competition with rearmament programmes This, however, has for the most part merely meant a few months' delay on special items It has been necessary to order all major items not less than one year ahead in order to have them in position in time Wherever this has been done, we have been able to obtain what we wanted, and, in general, the supply lines, once established have not been broken

Both WHO and UNICEF have had to do a great deal of work to make sure that the penicillin bought kept up with the rapid improvements being made New specifications have solved this problem for the moment

Achievements

In spite of all these difficulties, the record of achievement speaks for itself (see table I)

The schedule of treatment for adults has been 8 ml of penicillin [1] given in two equal doses Smaller doses were given to children The average percentage of persons receiving the second injection has been about 80 Approximately 5% have also received a third injection

By 1 April 1952, approximately 500,000 cases had been treated and the number is mounting by nearly 40,000 a month The total progress has been even greater than the figures indicate Fairly elaborate organizations have been established, central laboratories have been set up and field laboratories are being added as needed Most important of all some 250 workers have been trained and given field experience Of this number, 137 were added during 1951—about half in each country Thailand will increase its field staff by another 90 in 1952 (30 sanitary inspectors and lay personnel numbering 60 to give injections), which should double its field teams by August The advance in Indonesia will be somewhat slower during the remainder of 1952, but the addition of new teams and of 70 to

[1] The preparation used in yaws treatment throughout the Asian region is procaine penicillin with 2% aluminium monostearate (PAM) —ED

had not even been established with some of the outlying islands, and certain areas could not be entered because of security risks

(2) There had not been time to establish normal government budgets Moreover, often the simplest supplies needed for the programme were not available in the country because the bazaars were bare since the Japanese occupation The currency was still unstable As a result of this combination of factors, every step in organizing the campaign was unusually difficult

(3) There was an acute shortage of qualified personnel, with a very limited number of the male nurses on whom the programme relies so heavily, and with very few doctors Fortunately, however, there was a very small nucleus of doctors with long experience in yaws, without whose aid the entire programme would have been impossible

(4) The few teams that had been working on yaws were still using arsenicals and had to be convinced that penicillin was superior and to be retrained in the new techniques

(5) There was an extreme shortage of competent administrative personnel Those who were available, like the doctors, usually could not afford to work, in a time of rapidly mounting costs, for the small salaries the Government could pay

(6) In the early days there were serious difficulties in establishing and maintaining adequate records, obtaining adequate reports, and procuring analysis of the data after collection In addition to the language difficulty, the simplest office facilities were not available UNICEF has given some emergency help to meet this situation, and remarkable progress has been made

(7) Establishing and maintaining supply lines to the remote places where yaws abounds has been a major difficulty Fortunately, however, there is quite a good system of internal air transport, which alone made it possible to keep the supply line of penicillin unbroken Jeeps were used for the transport of personnel

(8) Maintenance of transport under rural conditions is not easy there are often no garages or repair stations of any kind, and petrol is not always available In Java itself the roads are relatively good, but, as the programme has moved to other islands, the teams have to go where roads are few and poor, and where the teams must maintain their own transport or walk

(9) The morale of the field staff at the beginning presented serious problems In order to reach the yaws cases, they often had to leave their families and to work without any increase in pay in remote jungles under conditions of tropical heat and rainfall The Government has done what it could under its regulations, and UNICEF has helped occasionally with emergency clothing and equipment, but, in general, the staff has been

working under conditions of real hardship. The greatest credit of all for the work that has been done belongs to these men in the field.

The story of Thailand is essentially the same. The financial position of the Government has been better, and the conditions of the workers have gradually improved, with the grant of double per diem allowances and, recently, an increase in pay. At the worst, however, the field conditions under which they work match the most adverse conditions in Indonesia.

In comparison with the difficulties faced by governments, those faced by the international organizations have been small. WHO's chief difficulty has been to find the specialized personnel for the international teams and to keep them long enough to give continuity to the advisory services. UNICEF has had considerable difficulty in buying equipment in competition with rearmament programmes. This, however, has for the most part merely meant a few months' delay on special items. It has been necessary to order all major items not less than one year ahead in order to have them in position in time. Wherever this has been done, we have been able to get what we wanted, and, in general, the supply lines, once established, have not been broken.

Both WHO and UNICEF have had to do a great deal of work to make sure that the penicillin bought kept up with the rapid improvements being made. New specifications have solved this problem for the moment.

Achievements

In spite of all these difficulties, the record of achievement speaks for itself (see table I).

The schedule of treatment for adults has been 8 ml of penicillin * given in two equal doses. Smaller doses were given to children. The average percentage of persons receiving the second injection has been about 80. Approximately 5% have also received a third injection.

By 1 April 1952, approximately 500,000 cases had been treated and the number is mounting by nearly 40,000 a month. The total progress has been even greater than the figures indicate. Fairly elaborate organizations have been established, central laboratories have been set up, and field laboratories are being added as needed. Most important of all, some 250 workers have been trained and given field experience. Of this number 137 were added during 1951—about half in each country. Thailand will increase its field staff by another 90 in 1952 (30 sanitary inspectors and lay personnel numbering 60 to give injections), which should double its field teams by August. The advance in Indonesia will be somewhat slower during the remainder of 1952, but the addition of new teams and of 20 to

* The preparation used in yaws treatment throughout the Asian region is procaine penicillin G in oil with 2% aluminium monostearate (PAM).—ED.

TABLE I YAWS CONTROL PROGRAMMES IN THAILAND, INDONESIA, AND THE PHILIPPINES, 1950-2

Country	1950		1951		1952 *		1950-2	
	Number examined	Number treated	Number examined	Number treated	Number examined	Number treated	Number examined	Number treated
Thailand	235 176	28 300	588 783	82 350	1 014 000	120 000	1 837 959	230 650
Indonesia	256 788	33 724	1 244 236	228 385	2 013 000	283 000	3 514 024	545 109
Philippines	—	—	102 245	9 554	841 000	23 000	943 245	32 554
Total	491 964	62 024	1 935 264	320 289	3 868 000	426 000	6 295 228	808 313

* The 1952 figures have been revised to show actual numbers for January to November, with an estimate of those for December. — S M K, 29 January 1953

30 doctors, assisted by the nurses from the local polyclinics and by diagnosticians, will, it is hoped, increase the rate of work by perhaps one third in the second half of the year On the other hand the areas of heavy incidence in Jogjakarta, where the main work has been done are being rapidly covered, and the number of cases treated per month will gradually fall A high percentage of the nurses now engaged on the work come from Jogjakarta, and it is not certain how many of them will be willing to go to other areas, or how many can be spared Unless they do go, or are replaced the shortage of personnel will be even greater than it is now

Cost per Case

Each treatment to date, on an accounting basis including all expenses costs slightly more than $2 50, of which approximately half is paid by the local government The cost to UNICEF of the Indonesian campaign for the 23 months from May 1950 to the end of March 1952 was as follows

	U S dollar
Penicillin (total amount used)	287 000
Equipment (estimated life—7 years)	26 151
Transport (estimated life of vehicles—4 years)	52,233
Personnel (reimbursed to WHO, up to the end of 1951)	27 000
Freight and field administration	40 000
Total cost (approximately 328 000 cases)	432 384

The cost to UNICEF per case treated in this first period was thus $1 32 of which the cost of penicillin was approximately two-thirds The average cost of penicillin over this period was $1 38 per vial of 10 ml containing three million units This cost will tend to fall as the mass programme expands, for the following reasons essentially the same equipment will serve for a larger number of treatments, WHO is paying the cost of international advisory personnel after 1951, and the price of penicillin is falling (The present cost is about $1 10 a vial) Assuming continuance of the same dosage, the cost per case to UNICEF in 1952 should be in the neighbourhood of $1 00 If the price of penicillin continues to fall, the cost will drop by about two thirds of the amount of the savings [a]

The cost to the Indonesian Government is somewhat more difficult to calculate On the basis of the Government's rough estimates for 1951, the expenditures were 3,950,000 rupiah for a period in which 223,045 cases were treated This represents about 17 rupiah 50 cents per case At the current official rate, this amounts to $1 53 Some of this expenditure was

[a] By the end of 1952, the cost of penicillin had dropped to about $0 40 a vial — S M K, 29 January 1953

for capital costs, but the recurrent costs were probably not less than the $1 32 spent by UNICEF

It will be noted that the costs are based, as indicated above, on a treatment schedule of 8 ml of PAM for adults, and that no contacts have been treated In the light of current WHO recommendations, it seems probable that the dosage for patients with clinical yaws may be lowered, *but it is also probable that the treatment of contacts now recommended* will require at least as much as the penicillin thus saved UNICEF is *anxious to effect all possible savings, but not at the expense of good results* For the present, therefore, it is being assumed that the requirements of penicillin per thousand persons inspected will not be less than heretofore

As a guide to UNICEF's budgeting and purchases of penicillin, we need to find answers to a number of questions, such as

(1) What should be the dosage for patients (by age or by weight) for mass campaigns ?

(2) Should PAM be given in two doses, as at present, or in one dose ?

(3) *Should contacts be treated ? If so, with what dosage ?*

(4) If contacts are to be treated, how should the category be defined *i e, should it be limited to members of the same household as patients* with open lesions, or extended to include other community contacts ? If the category is extended, who should be included ? Should it be the same for all areas or different for areas of different incidence ?

(5) If not all contacts can be treated, should preference be given to those in communities where follow-up is less likely to take place ?

Proposal for a Ten-Year Control Project

Rein & Kitchen remarked in the conclusion to their paper

"The cause of yaws is known A simple, safe and practical form of ambulatory [illegible] available [illegible] disease [illegible] oughout [illegible] ponemal [illegible] disease " *

If this conclusion is accepted, *certain practical* conclusions follow At least ten million cases of clinical yaws exist in south-east Asia, probably *three-quarters of them in* Indonesia It is likely that, in spite of all the difficulties that have to be faced, these cases can be treated within a period of ten years An average of one million cases a year may sound a bit startling, but, starting from scratch, we already have a rate of *treatment of*

* See page 107

almost half a million a year Even if contacts are added, the job can be done, for the time is spent mostly in finding the cases, not in treating them

The two countries with the most yaws in this area are Thailand and Indonesia In Thailand, although up to now only 10% of its probable total of one and a half million clinical cases have been treated a solution to the problem of control is already beginning to appear The Government has indicated its firm purpose of bringing the disease under control within the next five years and budgetary plans are being made accordingly including the provision of one third of the penicillin UNICEF has already agreed to provide money for the balance of the supplies and equipment to carry the campaign into 1953, and it is hoped that an additional $460,000 will become available to carry it through 1954 By the end of that year if present plans materialize, Thailand will have treated nearly two thirds of its cases, and by 1955, or 1956 at the latest, it should be moving into the fifth, or consolidation, phase

The heart of the problem in this area is in Indonesia where the number of cases is great and where the resources in trained personnel are extremely limited It must be recognized that the proposal to bring yaws in Indonesia under control in ten years calls for a mass campaign on a scale hitherto unknown in yaws work and that preparations must be made accordingly We know how to treat yaws, our problems are to obtain the necessary funds and personnel, and to build the organization to use the personnel effectively The chances for international aid to cover the programme up to the end of 1955 are excellent, and it is probable that money to buy the supplies that must be imported can be made available until the Government can take over full responsibility The most difficult problems ahead are those of organization

If such a programme is to be undertaken a well-conceived organizational plan must be drawn up Some of the requirements are

(1) All the methods of approach need to be brought together into one integrated system

(2) Additional doctors are needed to provide the essential supervision of the mass work Up to now progress has been hampered by the extreme shortage of qualified physicians, but it is hoped that from among the 250 doctors the Government is attempting to recruit abroad a number can be found either to work on yaws, or to replace local doctors who will

(3) Additional case finders must be recruited and trained

(4) The number of mantris (male nurses) in training should be increased in order that the expansion of the yaws control campaign can continue without robbing other essential services

(5) Money needs to be provided in local budgets so that the people trained will have jobs when they are ready Because of the extreme shortage of medical personnel, the danger of training too many people seems remote

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Proposal for a Ten Year Control Project

Rein & Kitchen remarked in the conclusion to their paper

> The cause of yaws is known A simple safe and practical form of ambulat therapy based on penicillin assay investigations and clinical evaluation is availa It is now possible to control the infectious stage and ultimately to eradicate the dise in a relatively short period of time There is no reason why millions of people through the world should be affected with this crippling and disfiguring non venereal trepone d sease [5]

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[5] See page 102.

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(5) Money needs to be provided in local budgets so that the people trained will have jobs when they are ready Because of the extreme shortage of medical personnel, the danger of training too many people seems remote

There will be plenty of work for them when they are no longer needed for yaws, which will not be for ten years It will be necessary, however, to work out a promotion system so that these workers will not find themselves in dead end jobs

(6) A few more administrative persons of the highest calibre are required, this is a major need and should receive proper administrative attention

(7) Additional funds for all local costs will need to be obtained as the programme expands Two very good reasons for providing the money are

(a) that it will ensure a continuance of international aid, which is now readily available but may not always be,

(b) that expenditure now will greatly reduce the cost of treatment later, after further infection, and will more than pay for itself in additional productive manpower

(8) The control work, hampered by shortage of specialized personnel urgently needs to be strengthened in order that every possible improvement in procedure and treatment may be applied to make the campaign successful and to effect every possible economy

(9) The organization of treatment of cases recurring after the mass campaign needs to be improved

(10) The existing health services must be strengthened in order that, once control is achieved, it can be maintained Unless this aim is built into the plan of operations from the beginning, the outcome will be failure

The next step is to translate these aims into a realistic plan of operations with responsibilities fixed and with time schedules worked out—broadly for the later period but quite precisely for the earlier [6]

[6] Since March 1952 encouraging advances have been made in line with the recommendations of a WHO advisory team, in developing a simplified plan making maximum use of *existing personnel* in polyclinics The goal of a million cases a year seems possible by 1954 —S M K 29 January 1953

SUMMARY

UNICEF is particularly interested in

RÉSUMÉ

Le FISE porte un interet particulier à la lutte contre le pian car la maladie atteint des millions d enfants et d autre part, peut être aisément guérie ou du moins *arretée* dans son expansion Le FISE a pour idée directrice de concentrer son action sur quelques maladies très *répandues*, justiciables d un traitement systématique relativement peu couteux Son intéret pour la

providing mainly food and clothing to provid ng med cal supplies

In the last three years the partnership between WHO as the body responsible for co-ordinating health programmes throughout the world and UNICEF providing suppl es on a large scale has led to the development of 100 projects in the Asian reg on alone

The money used by UNICEF is provided by voluntary contributions of which approximately 90% comes from governments th s means that it inevitably takes some time for the necessary sums to be voted by the various parliaments. However in the past enough money has been found to provide supplies when they were needed Although the l fe of UNICEF has been extended only until the end of 1953 the fact that its funds are allocated for some years in advance means that it can be assumed that it will continue to support yaws-control programmes at least up to the end of 1955

The author d scusses the various problems that have arisen in the yaws-control programmes with particular reference to Indones a and Thailand and goes on to consider what has been achieved despite them It is estimated that more than 6 000 000 persons will have been examined and more than 800 000 treated by the end of 1952 in Indonesia the Philippines and Thailand The schedule of treatment has been 8 ml of penicillin given in two equal inject ons By 1 April 1952 some 500 000 cases had been treated and the rate is increas ng by about 40 000 cases a month But there are st ll considerable problems of staffing and organization to be overcome

The cost of treating one case of yaws has been approximately $2.50 one half of which is borne by the local government The cost to UNICEF per case treated in the Indonesian campa gn for the period May 1950-March 1952 was $1 32 or a total of $432,384 for 328 000 cases treated

lutte antipianique ne s est manifesté cependant que depuis 1948 époque à laquelle il modifia l orientation de son activité et fit porter ses efforts sur la fourniture de médicaments et de materiel médical plutôt que sur celle de vivres et de vetements

Au cours des trois dernières annees la collaboration de l OMS — responsable de la coordination des programmes sanitaires dans le monde entier — et du FISE — procurant des quantites considerables de materiel et de fournitures — a permis d entreprendre de nombreux programmes dont une centaine dans la seule region as atique

Les fonds dont d spose le FISE proviennent de contributions volonta res 90% environ sont assurés par les gouvernements Or le vote par les parlements des sommes consenties par les divers etats exige inevitablement certains delais Malgre ces inconvénients le FISE a pu trouver jusqu à maintenant les sommes néces saires à l accomplissement des tâches qui lui incombent Bien que son activité n ait été prolongée que jusqu à la fin de 1953 le fait que les fonds sont alloués pour plusieurs années à l avance permet de penser que les programmes antipianiques pourront être financés au moins jusqu à la fin de 1955

L auteur examine les divers problèmes qui se sont posés au sujet des programmes antip an ques en particulier en Indonésie et en Thaïlande et il met en relief les résultats obtenus malgré les diff cultes A la fin de 1952 plus de 6 millions de personnes auront eté examinées et plus de 800 000 traitées en Indonés e aux Philippines et en Thaïlande Le schema de traitement consiste en 8 ml de pénicilline répartis en deux injections d égale quant te En date du 1[er] avril quelque 500 000 cas avaient été traites et le nombre des sujets soumis au traitement augmente d environ 40 000 par mois De graves problèmes relatifs au personnel et à l organisation restent à résoudre

Le coût du traitement s est élevé à environ $2,50 par cas, somme dont la moitié a été assumee par le gouvernement local La somme payée par le FISE pour chaque cas tra té au cours de la campagne d Indonés e durant la période de mai 1950 à mars 1952 a été de $1 32 soit un total

Owing to the facts that WHO is now paying the costs of the international personnel, that the price of penicillin is falling, and that, even with programme expansion, the same equipment can be used to treat a larger number of cases, the cost to UNICEF in 1952 should be about $1 00 per case

The author believes that the ten million cases of yaws in south-east Asia can be effectively controlled in ten years The largest number are to be found in Indonesia and Thailand The Thai Government intends to bring its yaws problem under control in five years and is planning its budget accordingly UNICEF will provide

the campaign should be in the consolidation phase

In Indonesia, the number of cases is *great and trained personnel is in very* short supply However, the chances that international aid will be provided until the end of 1955 are good, and it is hoped that money to purchase supplies can be made available until the Government can assume the full responsibility

The most difficult problems yet to be solved are those of organization The author lists ten essential requirements for a successful plan of organization *If these* are met, there should be every reason to hope for successful yaws-control in south-east Asia

de $432 384 pour 328 000 cas traités Grâce au fait que l OMS assume les frais de personnel, que le prix de la pénicilline a baissé, et que, malgré l expansion du programme, le même équipement peut être utilisé pour le traitement d'un plus grand nombre de cas, *les frais encourus par le* FISE en 1952 seront d'environ $1 00 par cas

L'auteur pense que les quelque dix millions de cas de pian existant en Asie du Sud Est pourront être traités efficacement en dix ans C'est en Indonésie et en Thaïlande que se trouvent le plus grand nombre de pianiques Le Gouvernement thaïlandais compte maîtriser le problème du pian en cinq ans et il établit son budget en conséquence *Le FISE a prévu l attribution de* fonds et de fournitures pour la campagne de 1953 A la fin de 1954, en Thaïlande, les deux tiers environ des cas auront été traités, et en 1956 au plus tard, la campagne entrera dans sa phase de consolidation

En Indonésie, nombreux sont les malades *et rares ceux qui ont les compétences nécessaires* pour s'occuper d'eux Il y a bien des chances cependant que l aide internationale soit maintenue jusqu à la fin de 1955 et l'on espère que les fonds permettant l achat de fournitures seront assurés jusqu à ce que le gouvernement puisse assumer cette charge en totalité

Les problèmes les plus difficiles à

sera couronnée de succès

DISCUSSION : PART VIII

Chairman Dr K W C. SINCLAIR LOUTIT
Rapporteur Dr N K JUNGALWALLA

It was considered that international organizations—particularly the World Health Organization and the United Nations Children's Emergency Fund—were playing, and would continue to play, important roles in the global elimination of yaws This disease occurs in areas that have underdeveloped technical resources and limited financial capacities To carry out successfully an undertaking of such magnitude requires outside assistance in the form of technical guidance and monetary assistance for the purchase of supplies and equipment

Other international organizations—such as the South Pacific Commission, the Colombo Plan, and the "Point Four" programme of the USA—can also usefully assist countries in their efforts to control yaws, a disease that clearly retards economic development by crippling and maiming millions of people in the underdeveloped rural areas of the tropics

There was considerable speculation as to whether improving the health of the people in these areas there would result in increasing the population and producing a consequent shortage of food Factors other than medicine would have to be considered, and improvements in agriculture, education, and the science of human relationships were highly desirable Nevertheless, physicians and public health workers could not be deterred by these considerations from healing the sick The vicious circle of disease, poverty, and hunger must be broken wherever it was possible to do so, and yaws represented one weak link in the circular chain

The economic implications of yaws are well known and enormous By controlling the disease, millions of workers will be able to till the soil, or carry out other work more effectively This cannot fail to have a far reaching effect on the economic development of vast areas of the world

DISCUSSION : PARTIE VIII

President Dr K W C. SINCLAIR LOUTIT
Rapporteur Dr N K JUNGALWALLA

De l'avis general, les organisations internationales — en particulier l'Organisation Mondiale de la Santé et le Fonds International de Secours à l'Enfance — *jouent et joueront encore un rôle important dans la lutte* entreprise pour supprimer le pian Cette maladie sevit dans des regions qui sont techniquement sous evoluees et disposent de ressources financieres limitees Pour mener a bien une lutte de cette envergure, ces pays ont besoin d'une aide exterieure, d'avis techniques et d'appui financier leur permettant l'achat de materiel et de fournitures

D'autres organismes internationaux tels que la South Pacific Commission, le Colombo Plan et le Programme du Point IV des Etats Unis d Amerique peuvent apporter une collaboration precieuse aux pays luttant contre le fléau qui retarde le développement économique en faisant de millions d'êtres vivant dans les zones rurales des tropiques, des infirmes et des mutiles

L'amelioration de la santé n'aura-t-elle pas pour conséquence un accroissement de la population et finalement une pénurie alimentaire ? Cette question fut l'une des plus debattues Il est certain que le probleme *ne doit pas être envisage du seul point de vue médical* L'agriculture, l instruction, les relations humaines doivent être ameliorees Mais les medecins et leurs aides ne sauraient être detournés de leur tâche, qui est de soigner les malades, par de telles considerations Il faut rompre, en l'un de ses *points vulnerables, le cercle vicieux maladie pauvreté-famine, or, le pian* est precisement l'un des chaînons les plus faibles de ce cycle

Les consequences économiques du pian sont considerables, elles sont aussi bien connues Le mal jugule des millions de travailleurs pourront cultiver le sol ou se livrer à d'autres besognes, avec un meilleur *rendement* Un tel changement aura, à coup sûr, des repercussions profondes sur le developpement economique de vastes régions du monde

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ILLUSTRATIONS *

* The following illustrations were kindly provided by Dr C J Hackett, Director The Wellcome Museum of Medical Science London England they have been grouped according to the field classification given in the footnote on page 255

Les illustrations qui suivent sont dues à l amabilité du D C J Hackett Directeur The Wellcome Museum of Medical Science Londres Elles ont eté groupées selon la classification adoptee pour le travail pratique qui figure en note à la page 256

1 INITIAL LESION — LÉSION INITIALE



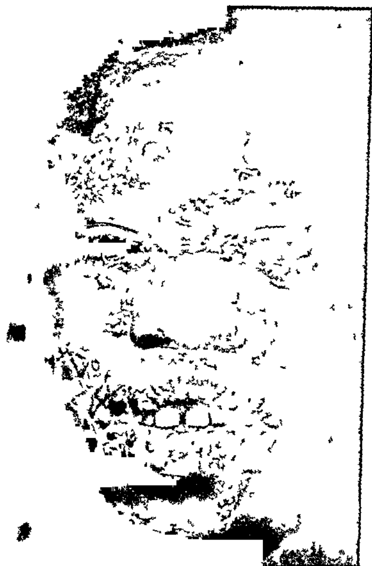
In a es on of gh anke   Lés on n a e de a che lle d o e

2. MULTIPLE PAPILLOMATA — PAPILLOMES MULTIPLES



Typical papillomata in left axilla — Papillomes typiques de l'aisselle gauche

3 MULTIPLE PAPILLOMATA — PAPILLOMES MULTIPLES



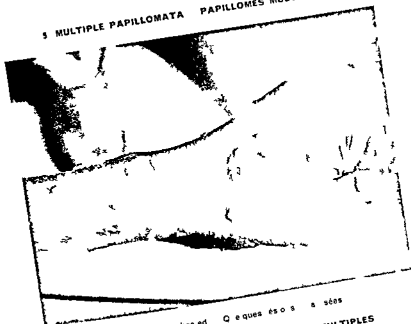
Lesions in various stages of evolution — Lésions à divers stades d'évolution

4. MULTIPLE PAPILLOMATA — PAPILLOMES MULTIPLES



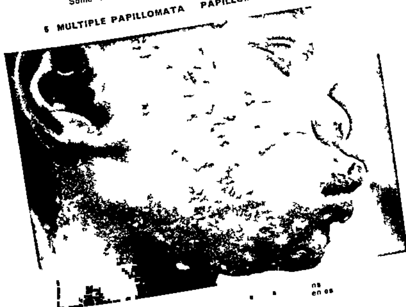
Lesions in various stages of healing — Lésions à divers stades de cicatrisation

5 MULTIPLE PAPILLOMATA   PAPILLOMES MULT PLES



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5 MULTIPLE PAPILLOMATA   PAPILLOMES MULTIPLES



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On ema que d a es

7 MULTIPLE PAPILLOMATA — PAPILLOMES MULTIPLES



Note a so othe ea ly skin les ons Includ ng p gmented macules w th desquamat ng ma g ns on outer surface of ght th gh — On rema que auss d aut es lés ons récen es de la peau y comp s des macu es p gmentées avec desquama on ma g na e sur la face exte ne de la cu sse d o te

8 MULTIPLE PAPILLOMATA — PAPILLOMES MULTIPLES



P anta pap loma — Pap lome p anta e

9 OTHER EARLY SKIN LESIONS — AUTRES LÉSIONS CUTANÉES RÉCENTES



Multiple papules of the face — Papules multiples de la face

10. OTHER EARLY SKIN LESIONS — AUTRES LÉSIONS CUTANÉES RÉCE



Papules on outer surface of right forearm — Papules sur la face externe de l avant bras

11 OTHER EARLY SKIN LESIONS — AUTRES LÉSIONS CUTANÉES PRIMA



Pigmented macules on pigmented surface of right forearm — Macules pigmentées sur partie pigmentée de l avant bras dro t

12 OTHER EARLY SKIN LESIONS — AUTRES LÉSIONS CUTANÉES RÉCENTES



Desquamation over right upper quarter of anterior surface of chest — Desquamation sur le quart supérieur de la face antérieure du thorax

13 HYPERKERATOSES — HYPERKÉRATOSE



Plantar changes in secondary yaws — *Pian secondaire* altérations plantaires

14. HYPERKERATOSES — HYPERKÉRATOSE



Palmar changes in tertiary yaws, slight contracture of little finger probably not due to yaws — Pian tertiaire altérations palmaires, légère contracture du 5e doigt qui n'est probablement pas d'origine pianique

15 GUMMATA AND ULCERS — GOMMES ET ULCÈRES



Indolent ulceration on anterior surface of left leg — Ulcération à évolution lente sur la face antérieure de la jambe gauche



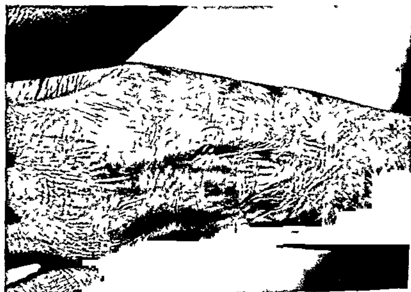
Early lesions — Lésions primaires

17 GUMMATA AND ULCERS — GOMMES ET ULCÈRES



Spreading ulceration and spontaneous healing on right breast — Ulcérat on extensive et cicatrisation spontanée du sein droit

18 GUMMATA AND ULCERS — GOMMES ET ULCÈRES



Atrophic scars resulting from tertiary ulceration — Pian tertia re cicatrices ré d ulcérat ons



Seve e u ce ation — U cé a on g a e

20 GANGOSA (RHINOPHARYNGITIS MUTILANS) — GANGOSA (RHINOPHARYNGITE MUTILANTE)



Moderate gangosa — Gangosa restreinte

21 GANGOSA (RHINOPHARYNGITIS MUT LANS) GANGOSA (RH NOPHARYNGITE MUT LANTE)



G oss gangosa Gangosa a an de



Secondary bone lesions with generalized swelling of limb and scars of recently healed secondary skin lesions — Lésions osseuses secondaires avec œdème généralisé du membre et cicatrices récentes de lésions cutanées secondaires

23 BONE AND JOINT LESIONS — LÉSIONS OSSEUSES ET ARTICULAIRES



Secondary polydactylis — Polydactylie secondaire

24 BONE AND JOINT LESIONS — LÉSIONS OSSEUSES ET ARTICULAIRES



Goundou — Goundout



Tertiary bone lesion, nodular lesions and frontal lesion — Lésion osseuse tertiaire, lésions ganglionnaires et lésion frontale



Tert ary bone les ons with ulce at on through sk n of les ons of left t b a — Lés ons osseuses tertia res et lés ons ulcérées du t b a gauche



Early tertiary skull les on — Lés on tert aire du crâne à son début



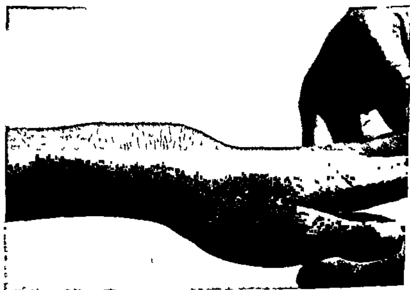
La e tert ary sku es on — Lés on tertia e avancée du c âne

29. BONE AND JOINT LESIONS — LÉSIONS OSSEUSES ET ARTICULAIRES



Tertiary monodactylitis with ulceration through skin — Monodactylite tertiaire avec ulcération

30 OTHER MANIFESTATIONS — AUTRES MANIFESTATIONS



Ganglion of left wrist — Tuméfaction de la gaine tendineuse du poignet gauche

31 OTHER MANIFESTATIONS — AUTRES MANIFESTATIONS



Juxta-articular nodules in patellar region — Nodules juxta-articulaires de la région rotulienne